THE RED MOUNTAIN

CROSS-COUNTRY SKI TRAIL

DEVELOPMENT PLAN

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1979-1981

Submitted to Len Dunsford
in partial fulfillment of the
requirements of W.R. 273

SUMMARY

This report provides a detailed cross-country ski development plan for the Red Mountain area, a development which is desired by the Red Mountain Ski Club, the Provincial Parks Branch and the public. In an attempt at solving the future local demands, this report outlines a system of five trails designed to suit the needs of intermediate level skiers. The plan calls for development to occur over a two year period.

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INTRODUCTION

The sport of cross-country skiing has its origins in the Scandinavian countries of Europe. In the past few decades it has rapidly become a popular winter activity in North America.

To date, cross-country skiing in the Red Mountain area has been unorganized due to a lack of proper planning. Even so, the Red Mountain Ski Club, the Parks Branch and the private sector have all indicated that there is a need for this development. (Smith, 1980; Whitfield, 1980).

The purpose of this report is to solve these problems by providing a development scheme for cross-country skiing to suit the needs of the interested parties. Therefore, the following report describes five proposed trails which will satisfy participants in the sport.

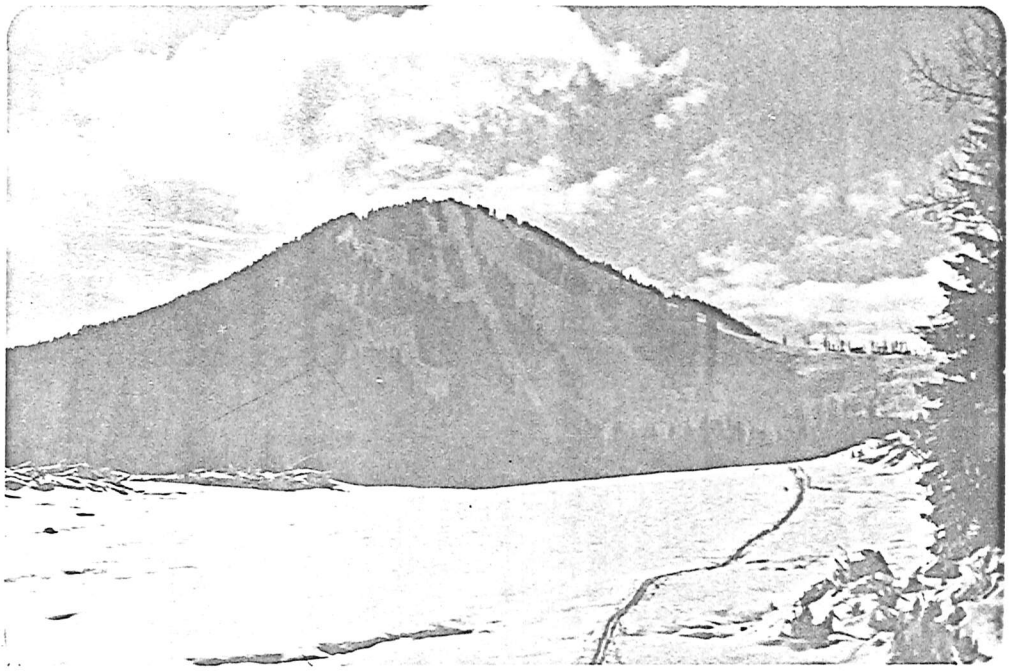


FIGURE 1. The Red Mountain Ski Hill.

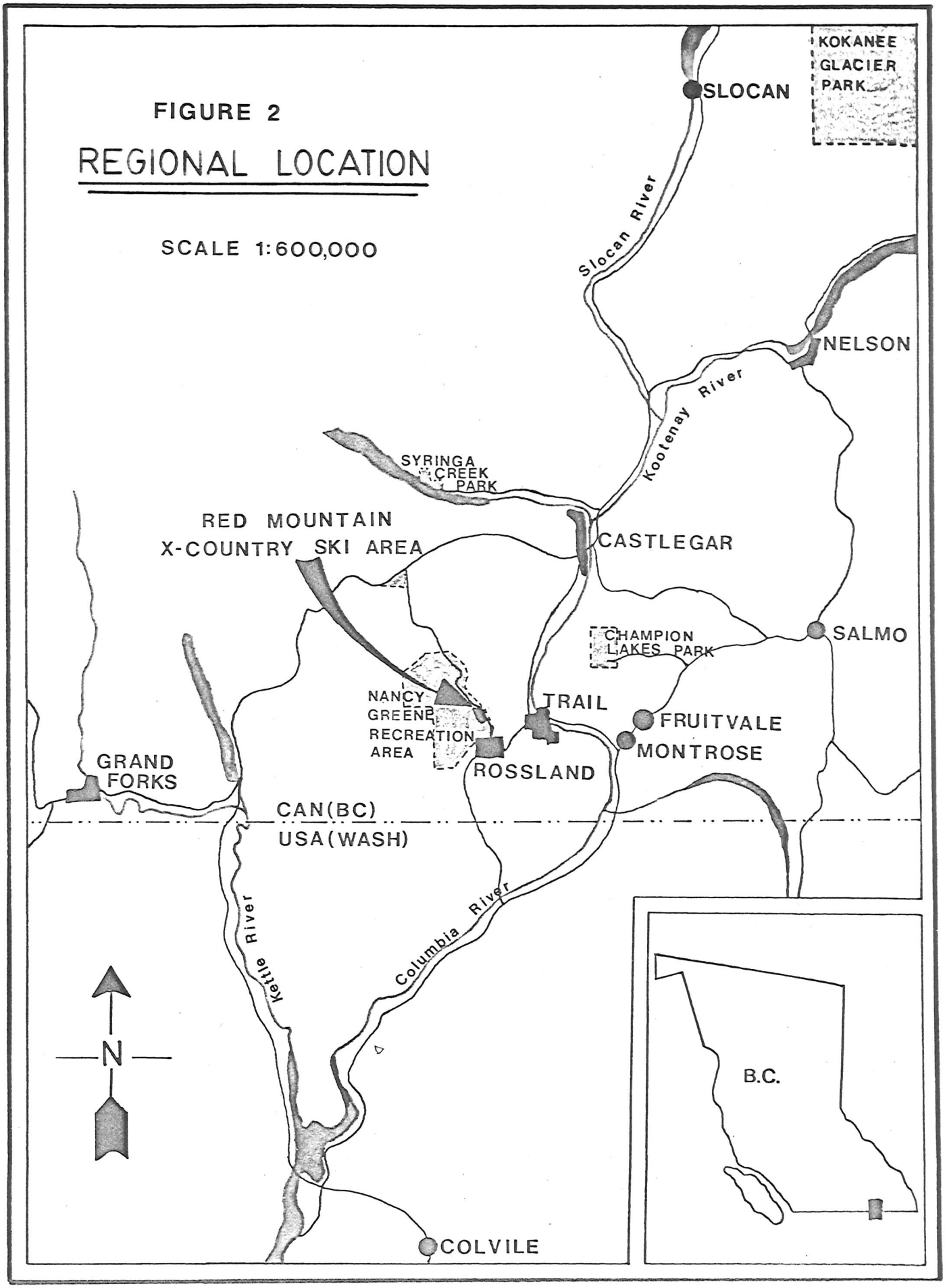


FIGURE 2
REGIONAL LOCATION
SCALE 1:600,000
KOKANEE GLACIER PARK
SLOCAN
Slocan River
NELSON
Kootenay River
SYRINGA CREEK PARK
RED MOUNTAIN X-COUNTRY SKI AREA
CASTLEGAR
CHAMPION LAKES PARK
SALMO
NANCY GREEN RECREATION AREA
TRAIL
FRUITVALE
MONTROSE
ROSSLAND
GRAND FORKS
CAN(BC)
USA(WASH)
Kettle River
Columbia River
N
B.C.
COLVILE

I LOCATION

The proposed Red Mountain cross-country ski trails, situated in the southwestern Kootenays, are three kilometers North of Rossland, B.C.. They are also within the boundaries of the Nancy Greene Recreation Area which has been set aside "to provide outdoor recreational opportunities in an upland setting" (Interim Policy Statement - NGRA, 1977).

Urban centers which are in close proximity to the area contain over 30,000 inhabitants. The centers include Trail, Castlegar, Nelson, Rossland and rural communities in between.

Road access is provided by Highway 3b, an artery of Highway 3, which is a connecting link for the southern extremities of British Columbia.

Castlegar, thirty-seven kilometers Northeast, is the location of the nearest major airport which has daily connections from Vancouver and Calgary by Pacific Western Airlines.

Table 1. Urban distances from Red Mountain

Place	Distance (Km)
Calgary	656
Castlegar	37
Cranbrook	230
Kelowna	355
Nelson	82
Vancouver	626
Trail	8

II BACKGROUND

The Red Mountain downhill ski facility has been operating for several years now. With the growing interest in cross-country skiing it seems necessary, because of the population base and developing need, to set up a system of trails as is the case at many ski areas throughout the province. Some of the popular multi-use recreation areas in B.C. include Manning Park, Mt. Washington, Mt. Seymour and Silver Star, all of which are operating successfully.

At present, a majority of the participating members in this sport, in the immediate area, are beginners. The Paulson Country Ski Area, twenty kilometers north of Rossland, is satisfying the needs of the beginners. The proposed area at Red Mountain will not only create a diverse recreational area, but also, because of the terrain, an area for refining one's skiing abilities.

The area was chosen through a simple process of elimination. The area had to be in close proximity to the downhill facility yet it had to be free of land use constraints; private land for example. As the east side of Highway 3b is under the control of private land ownership and the west side is public land within the Nancy Greene Recreation Area, the choice was obvious.

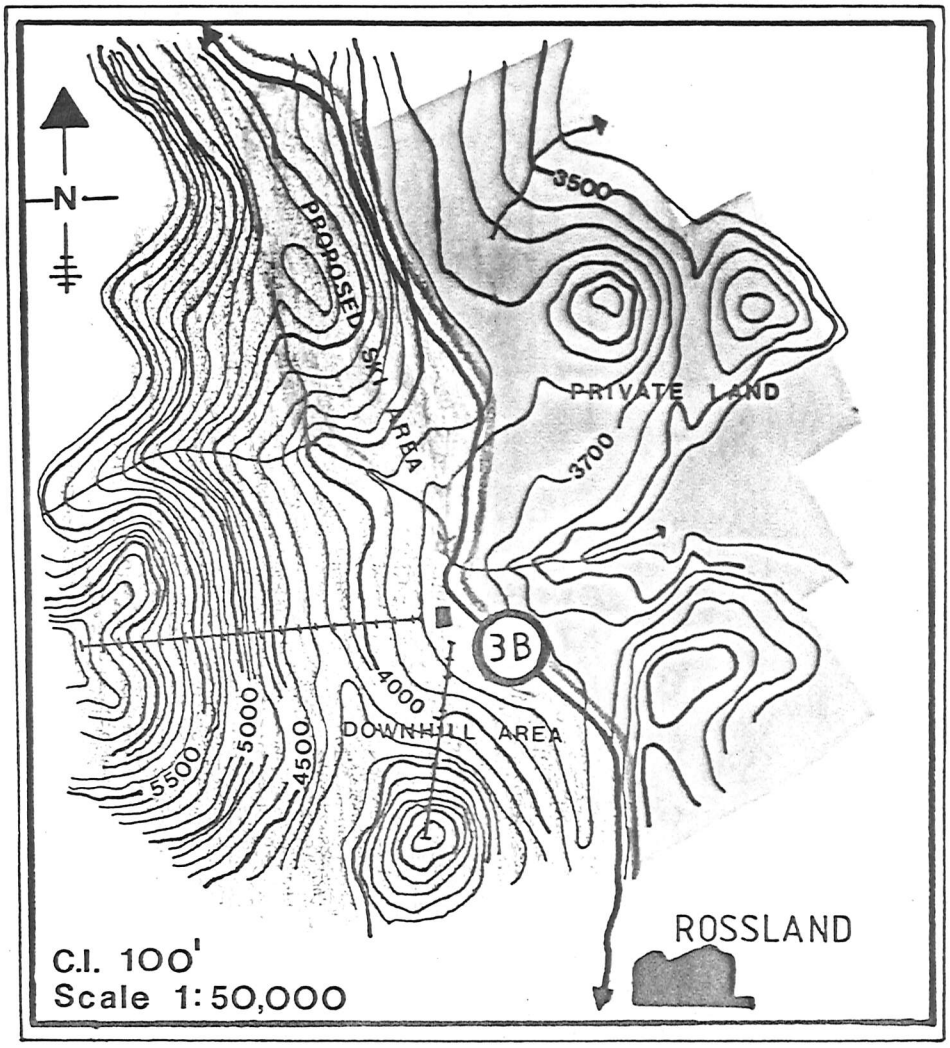


FIGURE 3 LAND USAGE

Information obtained from the B.C. Forest Service and the Red Mountain downhill ski plan indicated that land use on the west side of the highway was not dictated by other development plans such as logging or the future addition of ski runs.

Although the proposed area is too steep for beginner trails, which would normally deter trail development, there is a demand for trails of a higher caliber.

"From 1976 to 1979, use increase at the Paulson area was minimal, yet from 1979 to present it has been explosive. In 1981 there were 1400 recorded users in the area. Eventually skiers will find this area too easy and monotonous." (Leavers, 1981)

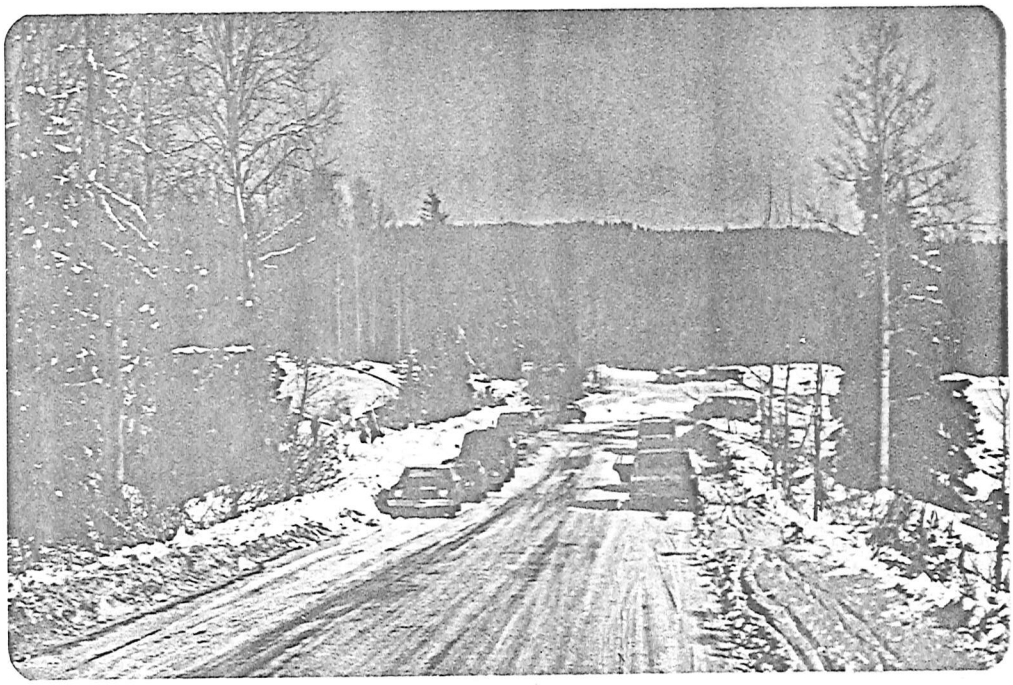


FIGURE 4.
Cross-country skiers parking on a private road near Red mountai

FIGURE 5.
Group use on Look Out trail.

III SITE PHYSIOGRAPHY

A. Climate : Recorded temperatures and snowfall indicate that the proposed trails are situated so as to produce five months of skiing.

Table 2. Snow fall and temperature averages

	Nov	Dec	Jan	Feb	Mar	April	May	Annual
Snow fall (cm) Elevation 990 m	42	84	86	62	42	9	3	344
Temperature (°C) Elevation 990 m	-1	-4	-5	-3	0	+6	+11	

B. Topography : The topography of the area is of glacial origin producing an irregular landscape of mountains and valleys. The trails are on an eastern aspect at an elevation between 3750' and 4700'.

C. Vegetation : Situated in the drier sub-zone of the Interior Western Hemlock, (IWHa), biogeoclimatic zone, the immature forest community contains Douglas Fir, Western Larch, Lodgepole Pine, Western White Pines, Cottonwood and Alder as tree species. With Kinnikinnick, Mahonia, Redstem ceanothus, White rhododendron, Snow-brush and waxberry as major shrub species. (Krajina, 1977)

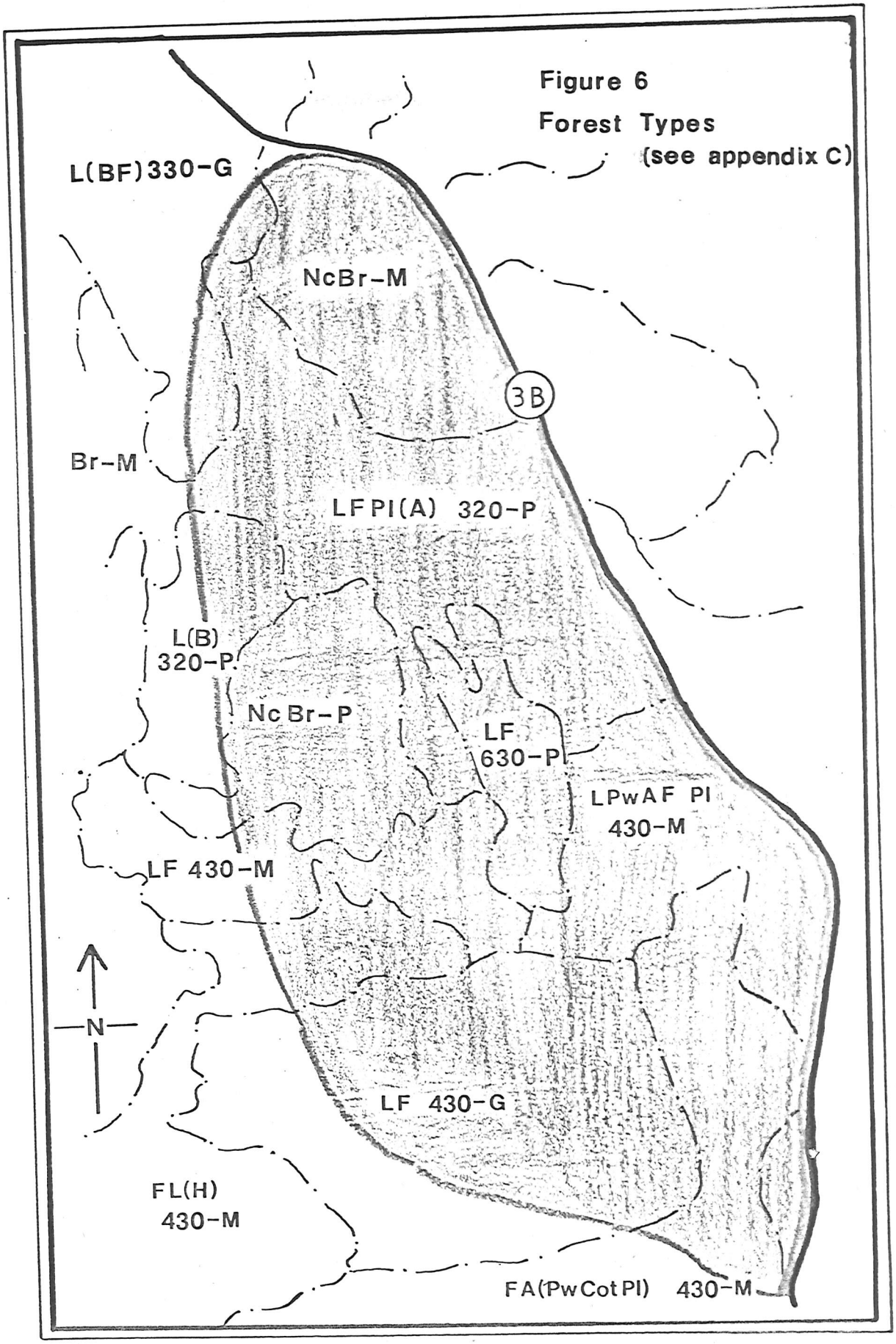


Figure 6
Forest Types
(see appendix C)
L(BF)330-G
NcBr-M
3B
Br-M
LF Pl(A) 320-P
L(B)
320-P
NcBr-P
LF
630-P
LPwAF Pl
430-M
LF 430-M
N
LF 430-G
FL(H)
430-M
FA(PwCotPl) 430-M

D. Soils : All of the soils in the area are of an Orthic - Humoferic podzol nature. These soils are moderatly to well drained, and are able to withstand compaction to the extent which is expected by the construction of trails

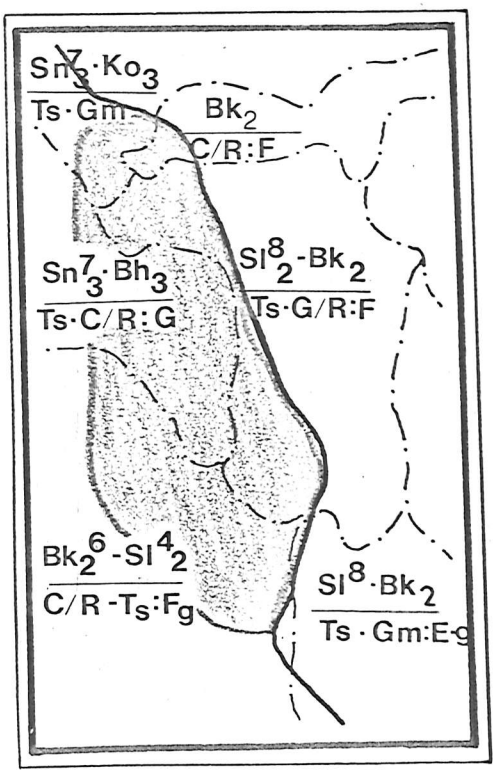


Figure 7
Soil Types
(see appendix D)

IV CONSTRUCTION STANDARDS

In order to maintain organization during construction, the following standards should be recognized.

All of the trails within the proposed system are of Intermediate status and must not exceed 25% slope. (Alberta Parks Planning Manual,1979)

These trails are to be double tracked throughout and clearing must be at least three meters wide and four meters on corners. Overhead brush must be cleared to a height of three and one-half meters. Bridges across gullies or streams are to be two meters wide.

Otherwise, construction should follow the guidelines set in appendix # A.

FIGURE 8, Present condition of the Backroad trail.

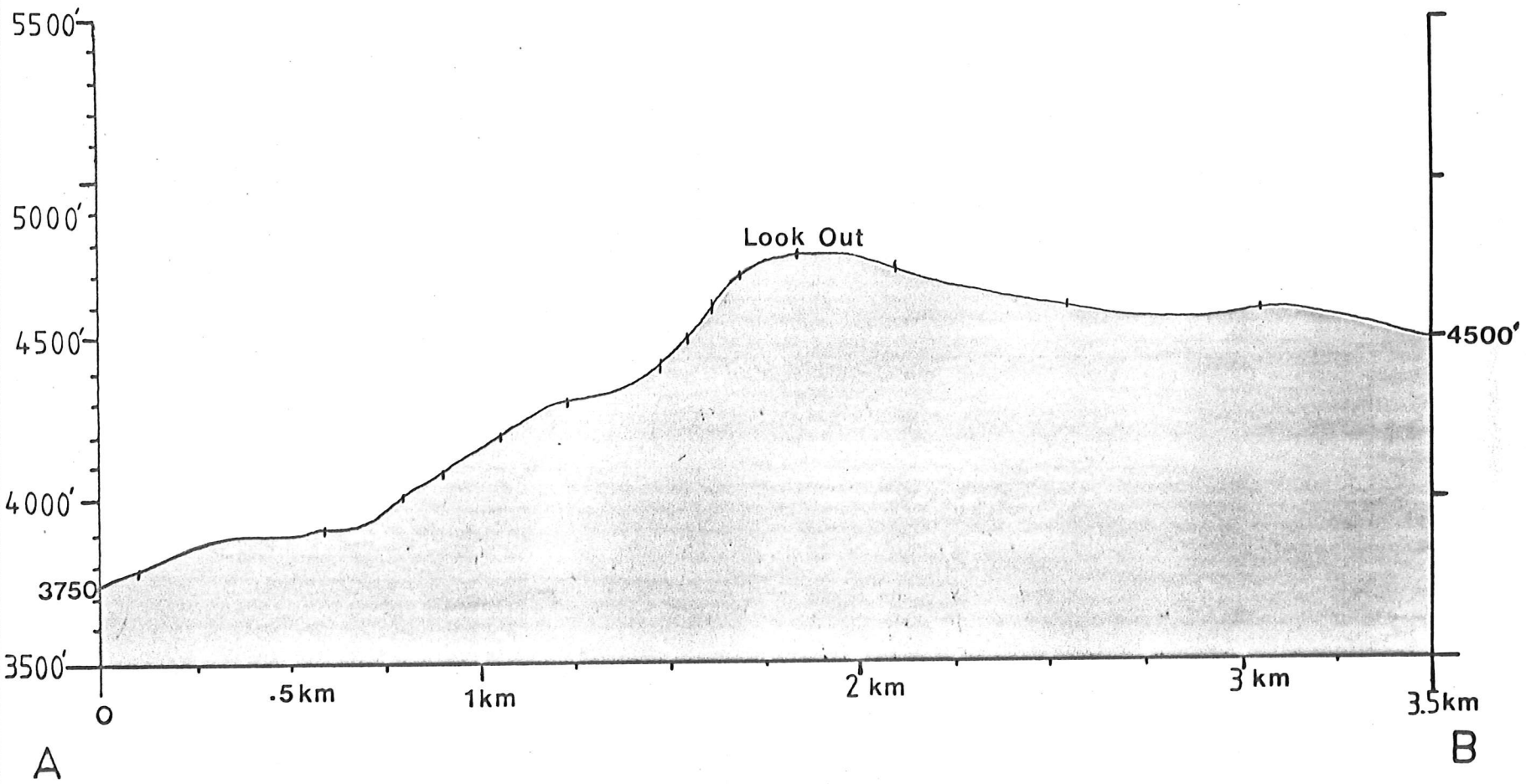
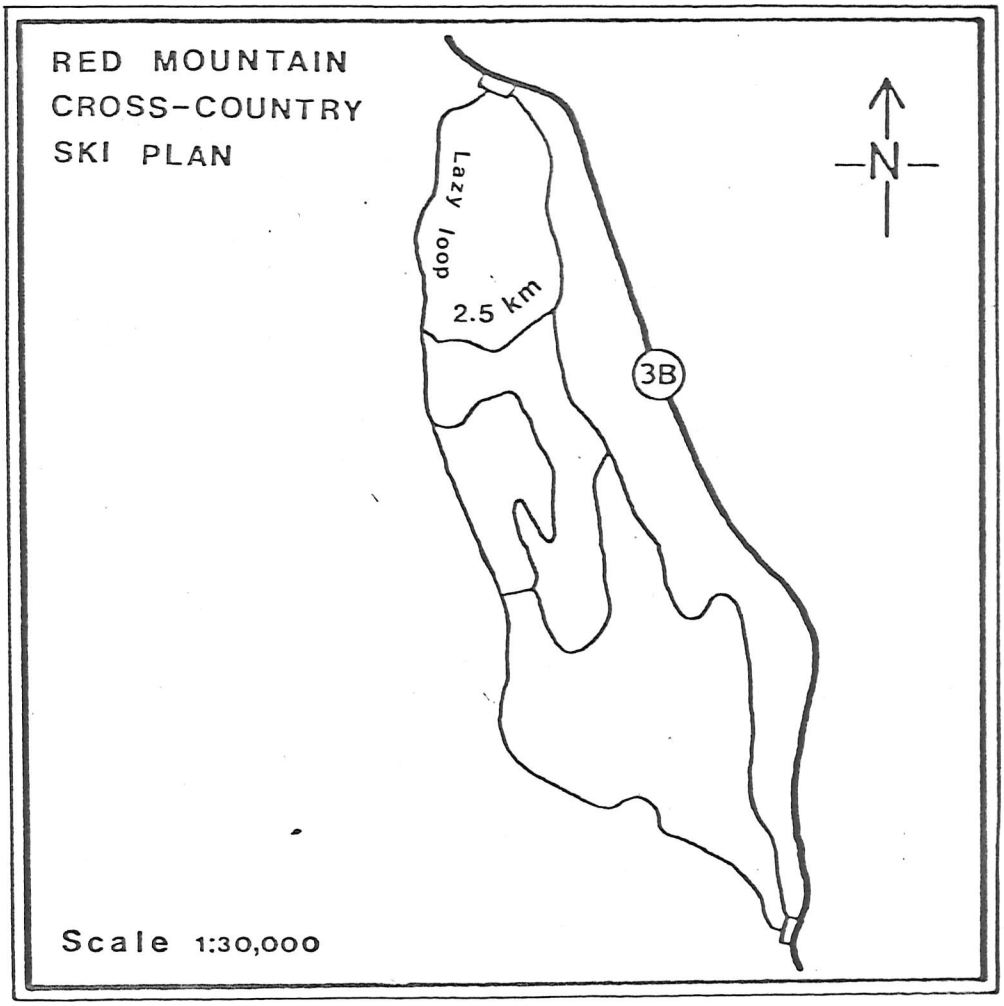


Figure 9 Profile of Area (see figure 10)

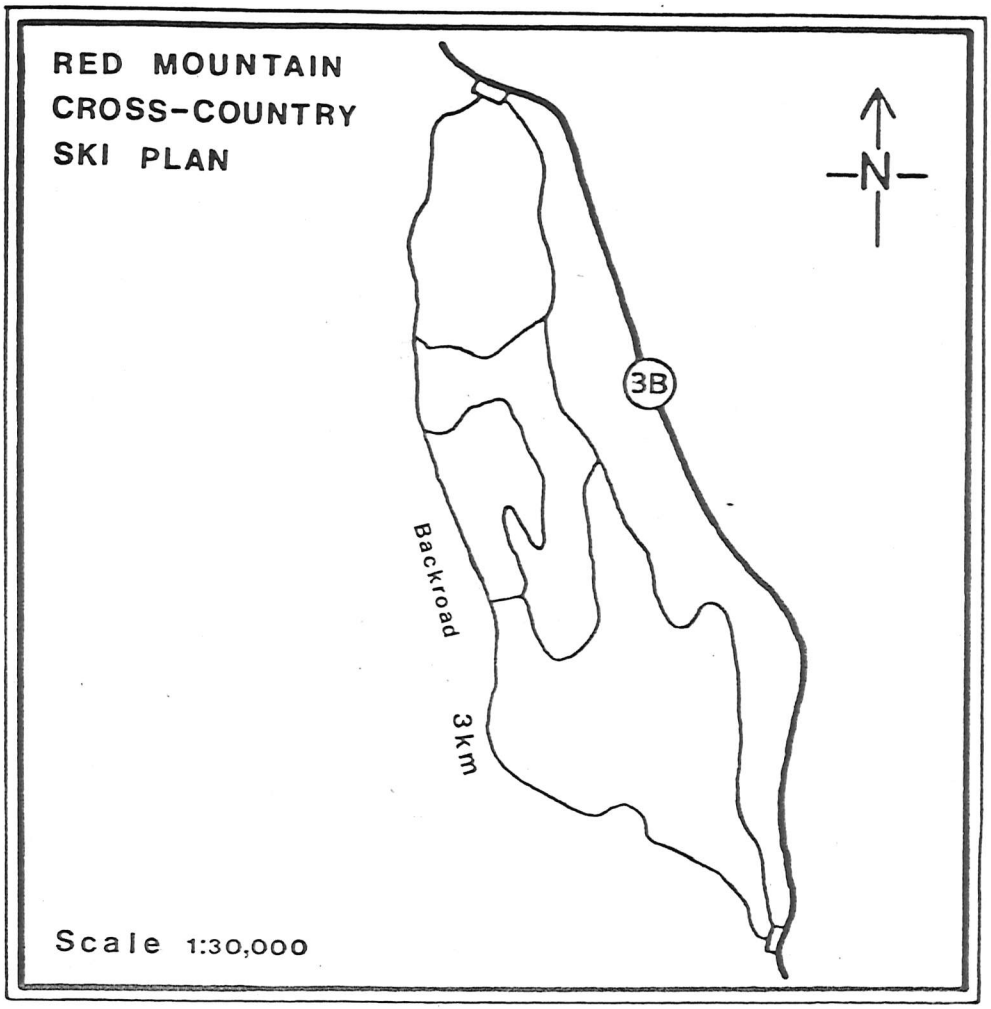
V TRAIL DESCRIPTION

The proposed system includes five trails totalling twelve kilometers. Each trail must be considered seperately during construction, due to varying terrain.



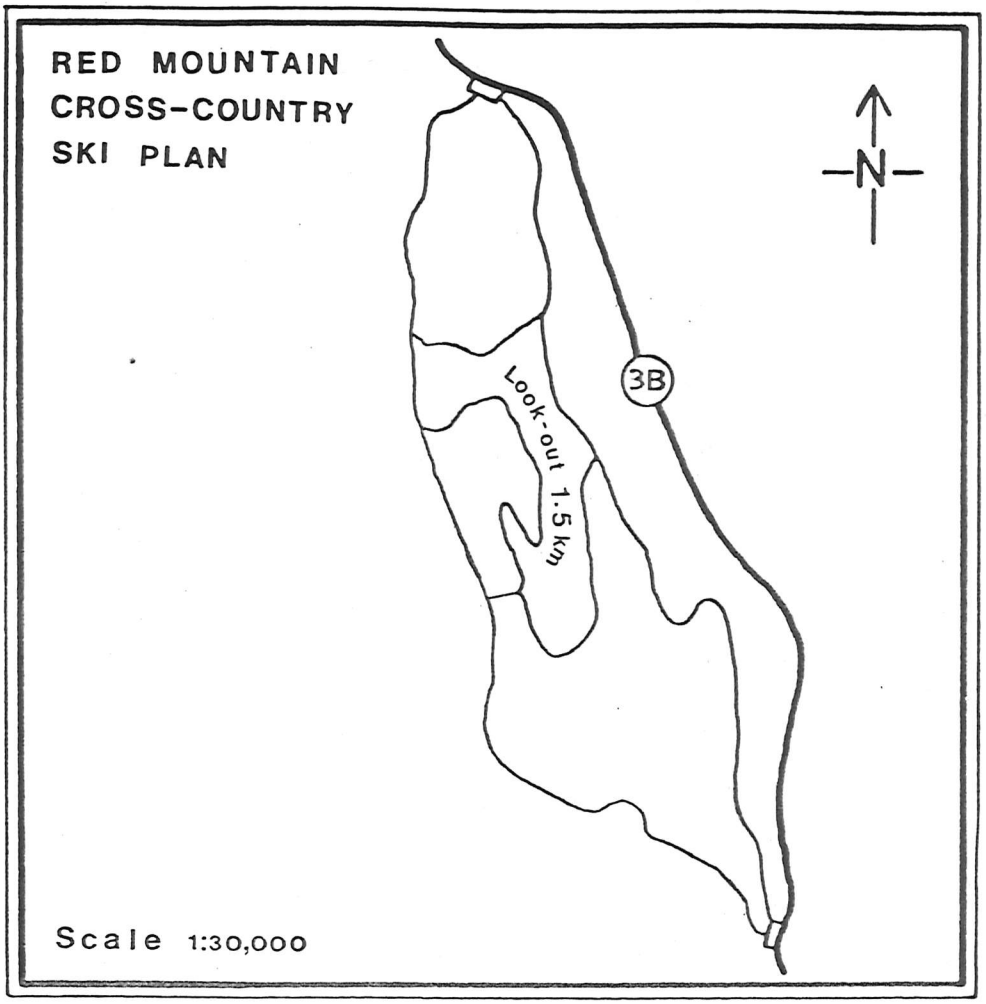
A. Lazy Loop

This 2.5 km loop will be a good warm-up trail for skiers as it has very little in the way of difficult terrain. Both the start and the finish are at the North Parking Lot.(1275 m). The maximum elevation reached is 1350 meters. The vegetation is moderately thick, consisting of brush or immature timber. No major construction problems are foreseen.



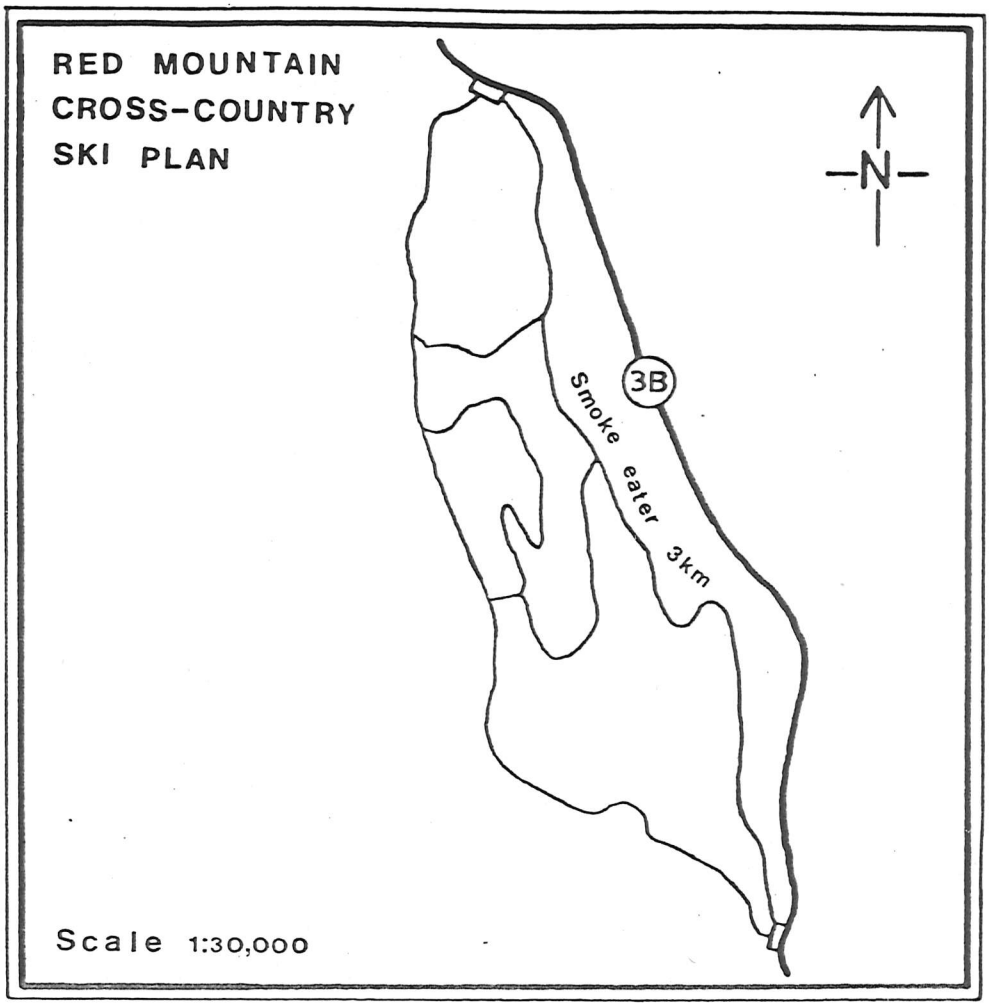
B. Back Road

The Back Road heads west from the South Parking Lot. It is three kilometers long, rising from 1060 meters to 1350 meters where it joins the Lazy Loop. The lower two kilometers is an old road which is presently used by skiers. The road is however, over grown and needs brushing. The top one kilometer is undeveloped. Construction requirements for this trail include the brushing of the road, the construction of five bridges and the clearing of the top uncleared kilometer.



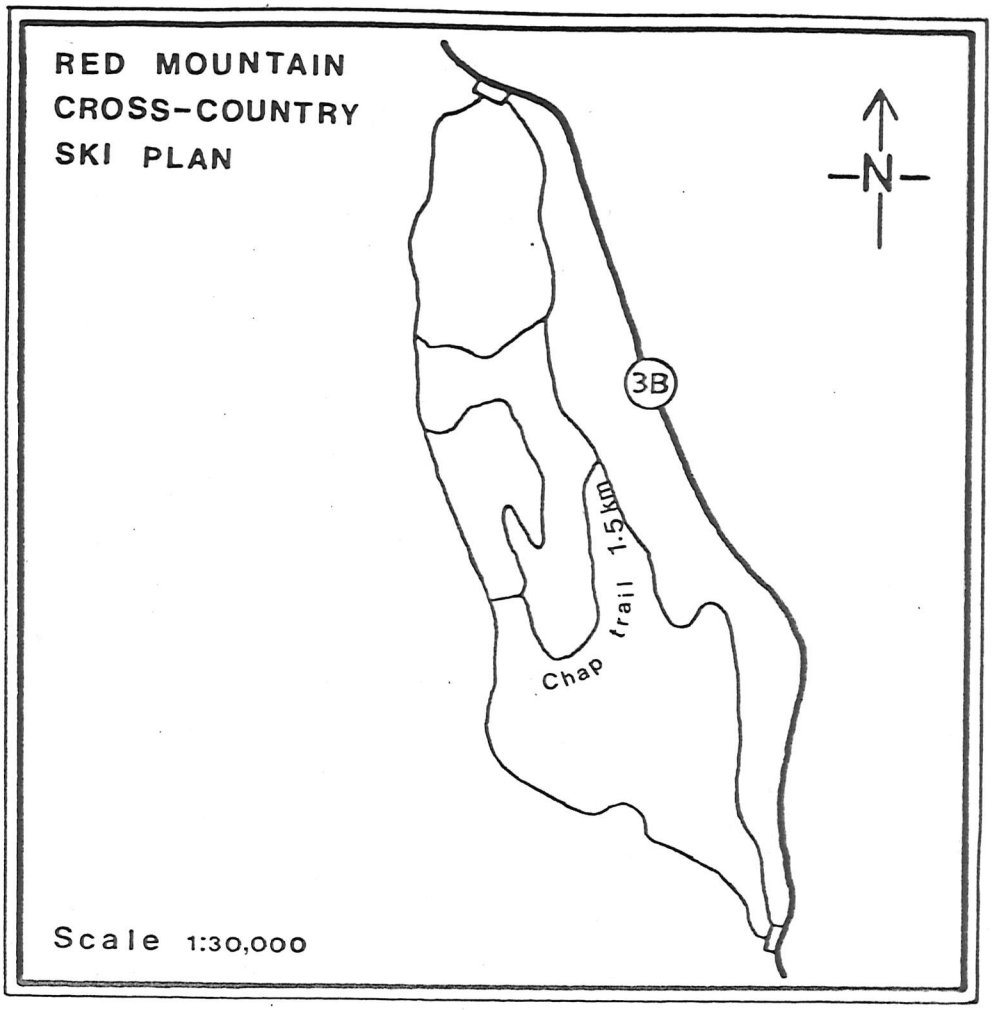
C. Lookout

In a 1.5 kilometer stretch this trail rises from 1300 meters to 1360 meters and back to 1330 meters. Much of this trail follows natural clearings from which an excellent view of the Columbia Valley is offered. A short section of side cutting in the southern portion is necessary.



D. Smoke Eater

Smoke Eater is a three kilometer trail which heads north from the South Parking Lot, following Highway 3b until it reaches the Lazy Loop. It climbs from 1060 meters to 1230 meters. The southern half is located in thick mature timber in which one bridge is required. The northern half cuts thinner vegetation, but side cutting is required in many areas.



E. Chap Trail

The Chap Trail is the link between the Back Road and Smoke Eater, 1320 meters and 1230 meters respectively. No major structures or any severe side cutting is expected during construction.

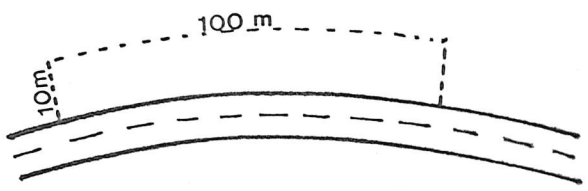
FIGURE 10
AERIAL PHOTO
(trail and profile location)

VI FACILITY DESIGN

A. Parking Area : Within a facility design, parking areas are considered to be a major financial setback. This is due to the costs of heavy equipment and landfill. The parking area may well be considered to be just that in this case; however, the Provincial Highways Department has been known to assist in the construction of such facilities in the past.

The appropriate method in seeking such assistance would be to survey the parking area, complete the brushing, then to contact the local department. These pre-contact actions will indicate project seriousness.

Both parking areas are to be capable of holding twenty-five vehicles each. Dimensions of the areas should be ten meters by one-hundred meters.



B. Signing : An efficient signing system is imperative for a well organized system. The signing scheme to be utilized here is best described in two parts: the parking area and within the system.

At both parking areas, a large map detailing the area is to be installed. It should include names and lengths of each trail, the location of each trail and a "you are here" arrow. An oblique painting of the system on plywood showing some of the local topography would be ideal. An information box

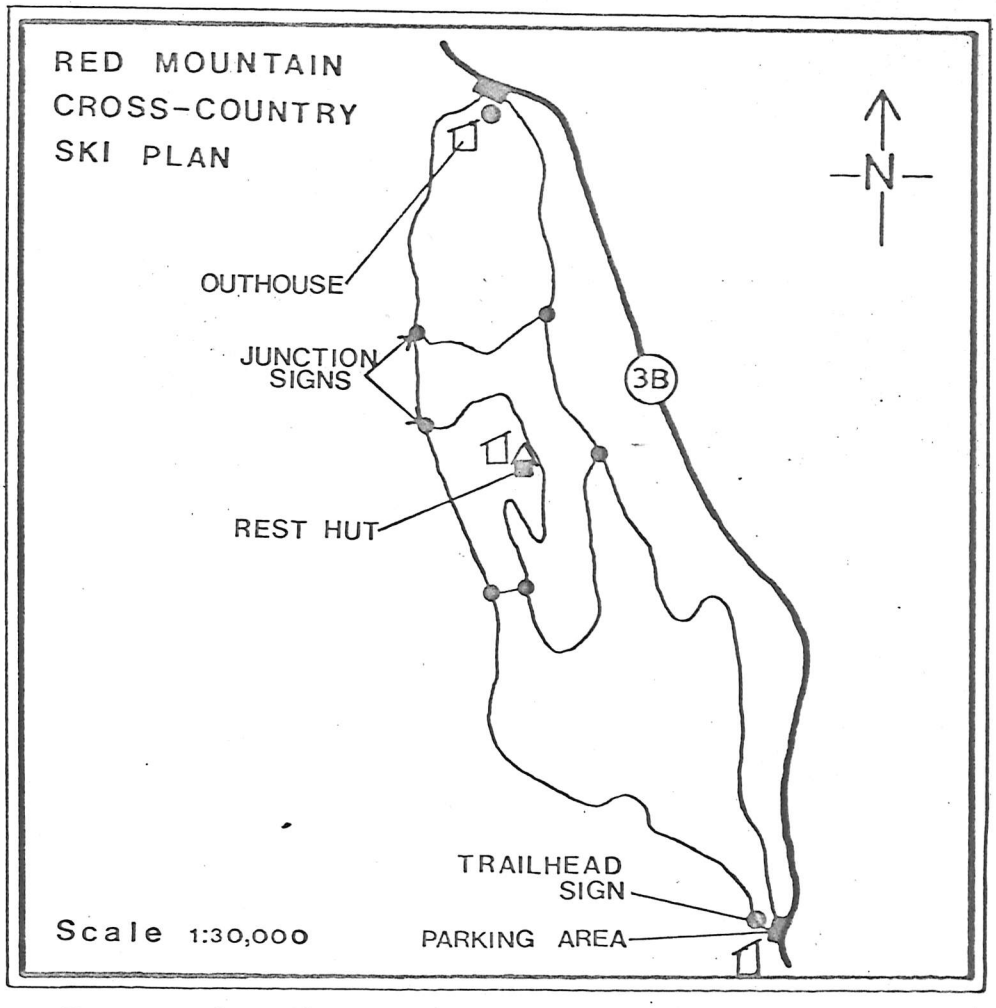


Figure 11 Facility Locations

containing a sign-in list and area pamphlets should be located near the trail-head sign.

The signs within the system include trail identification signs located at each trail junction on posts 2.5 meters above dry ground. These signs can also be produced on plywood.

C. Outhouses : A total of three outhouses should be adequate to serve the needs of the public. There should be one at each parking lot and another in the vicinity of the rest-hut. All should be positioned so as not to create an odor or visual impairment.

D. Rest-Hut : A rest-hut is not a necessity; however, it is a feature which attracts people (in the way a cabin does). A rest-hut situated at the summit of Look-out Trail will give skiers a goal to aim for at the start of a day.

The hut should compliment the area, so in this case a simple, low-key hut is sufficient. Possible dimensions for an A-frame hut could be three meters

high, five meters wide and ten meters long. A wood stove is nice, but not necessary or recommended in this situation because of the cost factor.

E. Track Setter : As it states in section IV, (construction standard) the system will be double tracked. A track setter may be considered to be "just another toy"; however, a system with mechanically tracked trails is attractive for a number of reasons which are as follows:

Tracked trails provide organization, enjoyment, and safety for skiers. The tracker makes those unskiable conditions, such as icy conditions, skiable. Also, over the course of a season the tracker compacts the snow prolonging the ski season.

A simple yet efficient tracker, which is pulled behind a snowmobile, would be adequate. Track setting should follow the guidelines set out in appendix # B.

VII COSTS AND SCHEDULING

The following are basic guidlines outlining a development program applicable for both the private interests and the interests of the Provincial Parks Branch. Development should occur over two years in both situations.

A. Private : Costs Based on 1981 Labour, Material, Equipment Rates

First Season	Costs
Trail Brushing Six man crew- Foreman 8.50/hr - Crew 7.50/hr Time- 35 working hrs	$1600
Parking Areas (2) Time- 24 hrs (includes all manpower and equipment)	$5800
Pamphlets (Area Maps) 1000	$100
Subtotal	$7500

Second Season	Costs
Signing Trail head and trail junction	$400
Outhouses (3)	$800
Rest Hut	$750
Track Setter	$1200
Fall Maintenance (two man crew)	$300
Subtotal	$3450

Two year developement costs total - $10,950

B. Parks Branch : Costs Based on Provincial Parks Labour, Material, and Equipment Rates (Price, 1981)

First Season	Costs
Trail Brushing Six man crew- Foreman 1660/mo - Crew 1389/mo Time- 35 hrs	$1880
Parking Areas (2) Time 24 hrs (includes all manpower and equipment)	$6500
Pamphlets (3-1-0(H)) 1000	$275
Subtotal	$8655

Second Season	Costs
Signing Trail head and trail junction	$400
Outhouses (3)	$1000
Rest Hut	$1000
Track Setter	$1200
Fall Maintenance (two man crew)	$500
Subtotal	$4100

Two year developement costs total - $12,755

CONCLUSION

The results of my report indicate that :

(1) There is an area suitable for a cross-country ski area on the west side of Highway 3b, just north of the Red Mountain ski hill.

(2) The area has the potential for an 11.5 kilometer system consisting of five double tracked trails.

(3) Development over two years would cost private developers $10,950, and the Provincial Parks Branch $12,755.

RECOMMENDATIONS

In order for this project to be successful, I recommend that :

(1) The Parks Branch be responsible for the trail and parking area construction as it is likely that they will maintain a high level of quality.

(2) The Red Mountain Ski Club finance the facilities including the outhouses, signs, rest hut, and track setter.

(3) The local cross-country association be responsible for the instalation of the facilities and help in the maintenance program.

(4) The three groups design a system of revenue collection from skiers to pay for the development and maintenance costs.

REFERENCES

(1) SMITH, DAVE. Ski Shop Owner. Interview, Oct., 1980.

(2) WHITFIELD, PHIL. Regional Planner. Interview, Oct., 1980.

(3) INTERIM POLICY STATEMENT. Nancy Greene Recreation Area, 1977.

(4) LEAVERS, DOUG. Recreation Technician. Interview, Feb., 1981.

(5) KRAJINA, VLADIMIR. 1977. Biogeoclimatic Zones of B.C..

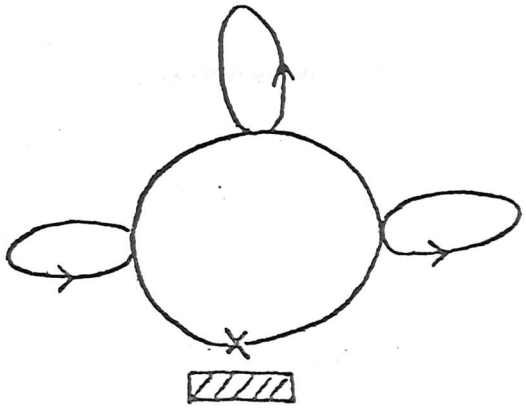
(6) ALBERTA PARKS CROSS-COUNTRY SKI AREA PLANNING MANUAL. 1979.

(7) PRICE, GARY. Provincial Parks Branch. Interview, Feb., 1981.

(8) ECOSIGN MOUNTAIN RECREATION PLAN. Sigma Engineering Ltd. Dec., 1980.

APPENDIX A

TRAIL CONSTRUCTION INFORMATION



3. Satellite Loop
   A wide range of alternatives each with its own characteristics. Some loops could have more use, some offering more solitude.

Building the Trail

Construction techniques for ski touring will vary throughout the province. In heavily forested areas, trails should be a minimum width of 5 m. This allows for snow to fall down and provides the necessary area needed to avoid snow cavities and snow drop from branches. Clearing should include inside limbing of trees to about 3 m. above average snow depth. The understorey vegetation should be cleared but the root system and ground surface should not be disturbed in order to minimize erosion.

Actual trail clearing should not be started until the route has been firmly established and temporarily marked throughout its entire length and approved in writing by the administering government agency.

1. Tools required: Hatchets, saws, axes, power saws, clippers (long-handled preferably), mattocks, hammers (for nailing markers on trees)* brush cutters.

   *Some people prefer to use the back of a hatchet for this purpose since the hatchet can also be used for removing small branches which may obscure the marker (thus enabling one to do two things with one tool).

2. All tools should be sharp and in first-class condition. Extra saw blades for Swede saws, and files for sharpening tools during the work, should be carried.

3. The power saw requires extra gas (mixed with oil), extra oil for the chain, tools to tighten the chain, and a round file for sharpening the teeth.

4. **First Aid kit is absolutely essential. Leaders must impress upon all participants the hazards involved, and ask them to use extra care.**

5. **Work gloves and other protective wear such as hard hat, face and ear sound protection when using power tools.**

Method of Working

1. The party should work in small groups, spread out along the marked route, and working carefully from one marker to the next. If everyone works in the same spot, there is more risk of injury.

2. Emphasis should be on thorough work, not on speed, even if this means coming back to finish the job.

3. When clearing through a heavily treed area the tendency is to use open patches to avoid unnecessary tree cutting and ensure good snow cover, entering the heavy trees only to join open sections or to maintain direction or desired profile. As these open patches receive more sunlight the amount of undergrowth is far more dense. In clearing this type of terrain it is recommended that the undergrowth be cleared first to beyond the maximum width of the trail. The removal of undergrowth will allow for safe and easy movement when felling and limbing of larger trees. Avoid cutting a number of trees without clearing under growth and limbs as this makes a real jungle which is very difficult to clear up afterwards.

4. Fallen branches, trees and rocks have to be picked up and placed carefully along the lower side of the trail; on a slope, this will stop sliding earth and foliage, and will eventually help to build up a shelf-like formation along which the trail will run. Do not just throw everything haphazardly all over the place; make use of it!

5. Mattocks should be used wherever necessary to carve out the slope, pulling the earth down onto the previously placed branches and trees, and achieving the same shelf-like effect.

6. In extremely steep sections, a long tree trunk can be wedged, parallel to the edge of the trail, against two standing trees, and the gap between trunk and slope filled in with small branches, rocks and earth - again achieving a "shelf" for the trail.

Right of Way Clearing

For main trails where intensive use is expected, there should be enough room for two or three sets of tracks. The minimum width for two tracks is 3 m. and for three tracks 4 m. For single tracks width of 2.5 m. is recommended.

Clearing height should be 2.5 m. plus the maximum snow depth expected. Where branches are likely to droop under the weight of snow or ice, extra room should be provided.

Technical Aspects of Trail Building

Small streams which freeze solidly can be crossed without bridging; however, if bridges are installed the trail season can be extended.

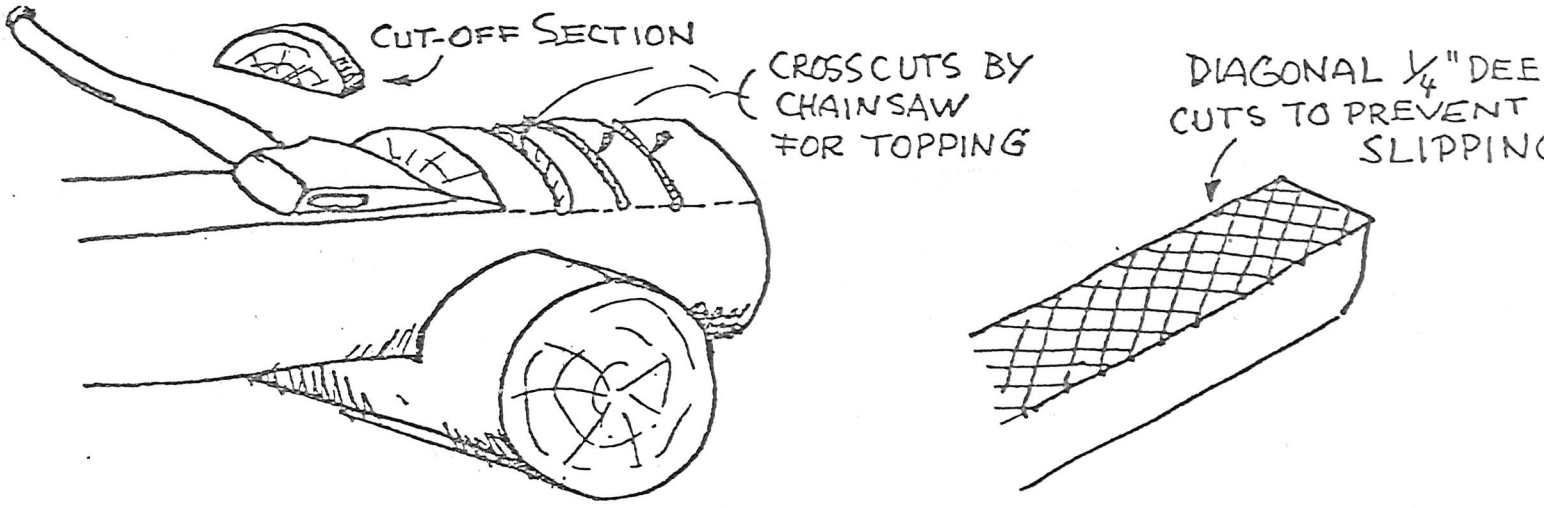
Bridges should be wide enough for track and poles. Railings should be included on narrow bridges which are of sufficient height to be dangerous. Bridges should be strong enough to support trail grooming equipment.

For shallow streams where bridges are not required during other seasons, brush fill crossings can be used. Piles of brush are stocked across streams in late autumn. These must be thick enough to ensure that the snow layer will be well above the water level. Bridges should not be located at bottom of downhill runs and approaches should be reasonably straight and level.

3. Make the base logs longer if the mud is very deep.

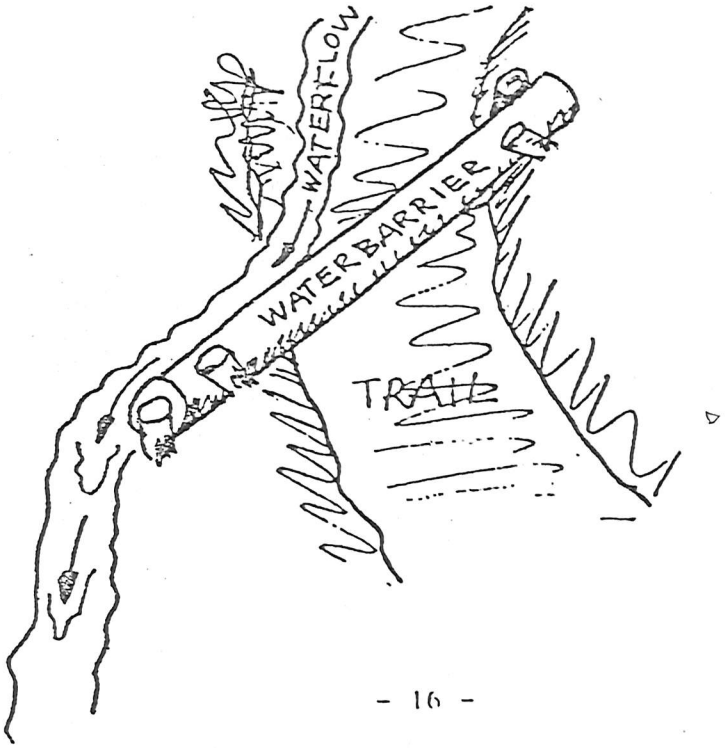
4. Topping is best done by making cross-cuts with the chain saw, two inches apart, then cutting off the sections with an axe or a mattock. Very effective are diagonal cross-cuts 1/4" deep over the flat surface of the topped log to prevent slipping.

5. Rocks or stable soil should be used at each end of the bridge.

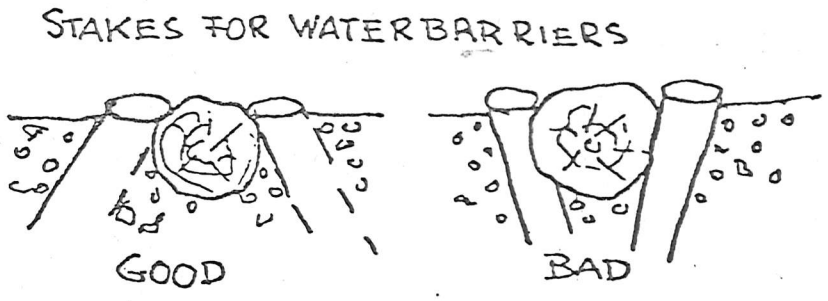


Waterbars are an effective way to deal with water run-off on steep slopes with unstable soil.

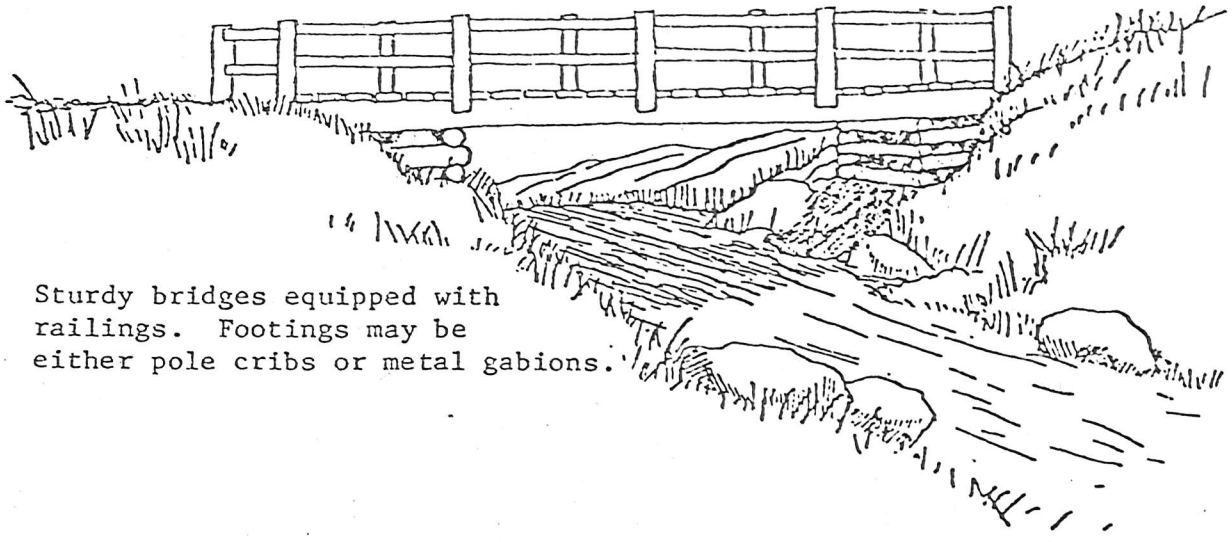
6. The diameter of a waterbar should be at least 5" to 6". It should extend to the outside edge of the treadway on both sides.



7. Dig a ditch 5" to 6" deep on the uphill side of the bar to lead the water. The stakes to hold the bar should be driven in at an angle to form an inverted "V" over the bar. Cut them flush with the bar.



Bridges



Sturdy bridges equipped with railings. Footings may be either pole cribs or metal gabions.

Second person — Using brush hooks and axes, this person cuts down all smaller shrubs and roots.

Third person — Using a fire-rake or similar clearing device, this person clears away all fallen debris and makes the trail surface clear of any major branches and obstacles.

These numbers can be easily doubled if more volunteers are available.

Construction using a trail crew should take place on a section to section basis. If the trail route has been plotted on a map or air photo it will simplify matters in designating different sections along the trail.

Of course, if you have the equipment and want a lot of trail cut quickly, heavy equipment can be used, but it will still require a trail crew to follow behind for clearing debris and levelling the trail surface.

TRAIL CLEARING TECHNIQUE

TRAIL CLEARING TECHNIQUE

1. Mark all trees that are to be cut beforehand so the cutter doesn't cut unnecessary trees. Be conservative in the number of trees that should be felled.

   Note: Depending on trail location and other site factors some trees may be felled to fall across the trail, to discourage use by motorbikes or snowmobiles, especially at the trailhead.

2. Using a fire rake, polaski or similar tool, brush should be cut out by the roots to prevent further growth. As it is cut it should be cleared to the downhill side of the trail and packed to provide a more even surface especially if on a slope. Dirt thrown on top from uphill will root grass and stabilize any erosion. A slight cross-slope of 5 or 10 degress can make it difficult to use snowmobiles for tracksetting since they slip laterally. Try to ensure that the trail surface is fairly level, even if you are traversing a hill.

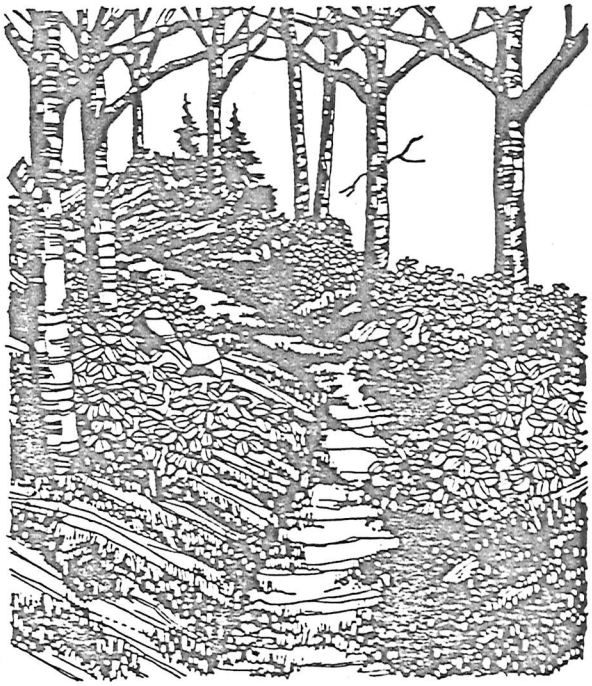
3. As you go along, ensure that all sharp projections to the side of the trail are cut off so a falling skier will not impale himself on cut branches or catch his ski in tree roots.

4. Sharp depressions should be filled or cut back to provide even contours. If there are channels for water run-off, try and find old culverts which can be placed in them before filling. This will prevent a washout each year.

5. Turns should be widened and slightly banked to assist the skier in turning, especially if going downhill.

6. If cutting the trail and the growing season has not finished, plant fescue or clover in the earth cut track sections to prevent erosion and to make it pleasant to hike and train on.

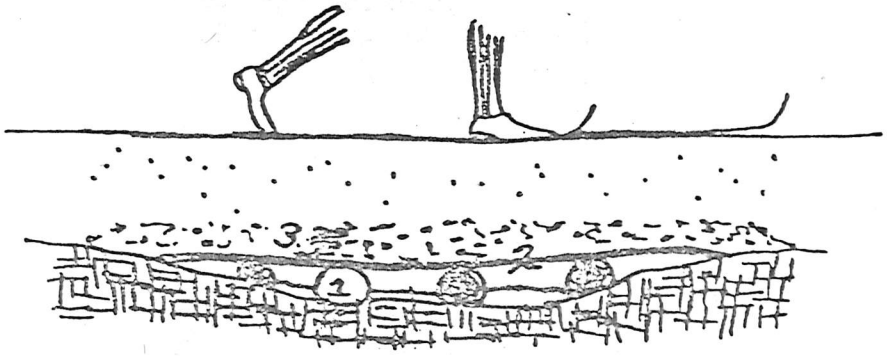
7. Try not to locate the trail under a thick cover of conifer trees as snow depth underneath may not be sufficient to pack a proper trail. If the trail must go through a conifer thicket trim some of the overhanging branches so that more snow will fall on the trail.

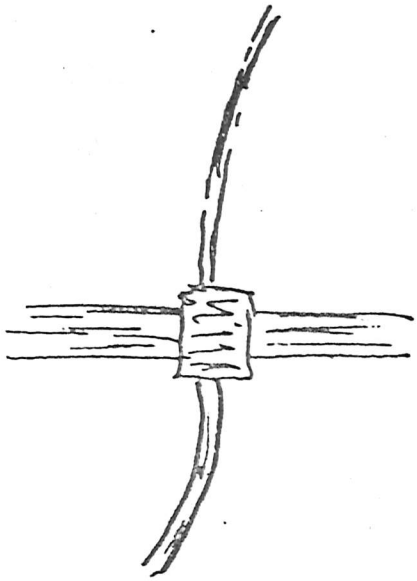


INCORRECT TRAIL CLEARING

- Narrow Trail
- No Banking on Curve
- Plant Material not Cleared
- Sharp Angles on Banks

Brush Bridge





1. Logs laid parallel to direction of waterflow.
2. Saplings laid at right angles over logs.
3. Brush laid at right angles over samplings.

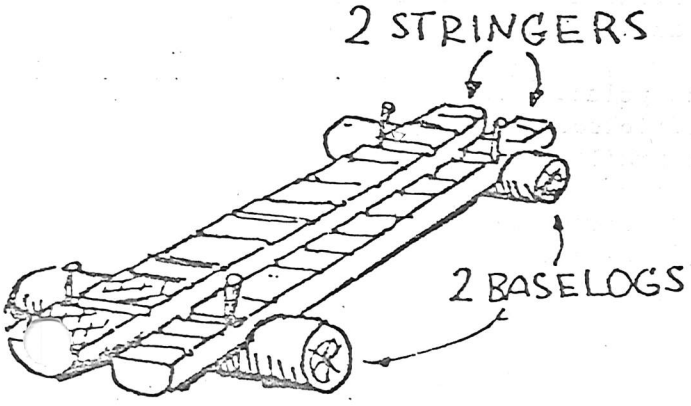
Plan View

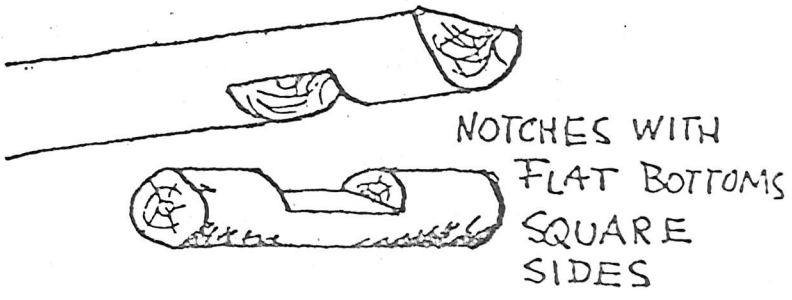
Bridges

Bridges constructed of native materials provide a simple and effective method to deal with erosion and vegetation damage in wet or boggy sections of trail. These bridges can also be used to ford small streams and gullies.

1. Select trees that are straight and most uniform in diameter and with the least amount of branches. Logs must be peeled.

2. If the log is more than 12" in diameter at its thinner end, one single stringer is sufficient. Otherwise, two stringers have to be used side by side. The corresponding notches have to be cut in such a way that their sides, rather than the bottoms are touching. This will ensure snug fit and will prevent rocking of the stringers sidewise.





CORRECT TRAIL CLEARING

- Widened Trail on Curve
- Well Banked
- Curve Cleared of Plant Material

CLEARING HEIGHT

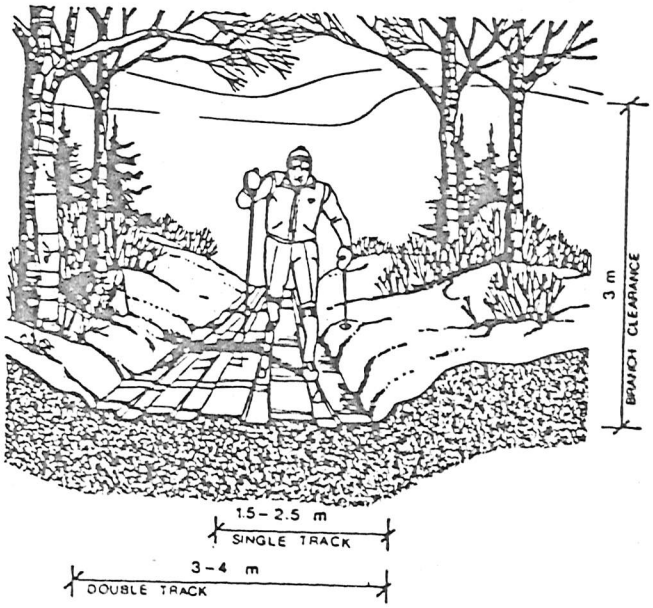
Brush and trees should be cut to a height of about 3 m keeping in mind average winter snow depth for the area through which the trail is being planned.

RIGHT-OF-WAY CLEARING

For single track trails, widths of 1.5 to 2.5 m are recommended. The narrowest width should only be used for minor trails.

For main trails, where intensive use is expected, there should be enough room for two or three sets of tracks. The maximum width for two tracks is 3 m and three tracks is 4 m.

CLEARANCE DISTANCES



If major events are being planned or a lot of use is anticipated, the first ¼ km of the trail system may be cleared to an even wider width to accommodate 5 - 10 skiers (at least 8 - 10 m wide).

Where grooming equipment is to be used, a minimum width of 2.5 m is required. This allows enough space for efficient operation and safeguards trees from being scraped by machinery.

On slopes, sufficient clearance should be allowed for the safety of falling skiers and to allow skiers room to herringbone or side-step up. This will also provide space for ascending skiers to step out of the way of downhill skiers. On slopes exceeding 10 percent, curves should be banked and left clear of trees in order to allow skiers to stop safely.

On long runs widened sections should be provided at intervals to allow skiers to control their speed by stopping or running off the trail.

APPENDIX B

TRACK SETTING INFORMATION

TRAIL GROOMING

A well maintained cross country ski trail is a high-use recreational facility. Trail condition and marking should be checked periodically, especially after every snowfall. This makes trail location easy even when old ski tracks have been covered by new snow.

Trail grooming involves packing newly fallen snow and bettering poor trail conditions, such as hard pack and ice, by breaking up the hard surface. The amount of grooming necessary increases with the number of skiers using the trails. After considerable use, trails become hardpacked and often rutted when wet snow freezes. This makes control difficult and skiing tedious, especially on hills.

Track setting involves producing a set or sets of two ski tracks, spaced six inches apart about two inches deep and about three inches wide, which are good dimensions for skis to follow.

Grooming and track setting can be done either manually or mechanically.

MANUAL GROOMING AND TRACK SETTING are effective only in soft snow conditions. Snowshoes are used for packing and smoothing the surface, and skis are used for setting the tracks. But if the surface is too hard, neither grooming nor track setting can be done manually.

Snowshoe packing is time-consuming work. It requires four persons walking the trail side by side at least twice. This is necessary to assure that the tracks will be firm enough to resist breaking down with repeated use. Manual track setting is best done in the late afternoon so that the tracks will freeze-in with the lower temperatures of the night. This is known as letting the tracks 'set up'.

To set a good durable track requires about 10 skiers following each other in the same set of tracks or fewer skiers going over the tracks several times. The lead skier in the group setting the tracks must keep his skis straight and at a constant spacing of six inches. The skiers following ski in the leader's tracks.

MECHANICAL GROOMING AND TRACK SETTING is far more efficient and can handle many jobs not possible using traditional manual methods. The only requirements for the use of mechanical equipment are that the trails be wide enough to allow passage, and that the terrain not be so severe as to prevent the use of snow vehicles involved. Narrow bridges, deep depressions, unsafe ice over water, and steep hills hinder or prevent the use of such equipment. Trails should be designed to allow for the use of mechanical devices expected to be used.

Packing a trail with a snowmobile is easy, but there are a few tricks to producing the desired smooth trail. First, packing cannot be done well at high speeds because snowmobiles lose directional control as speed increases. Second, pack in several passes. Start by packing the extreme side of the trail and work towards the opposite side with each pass. Packing an entire trail width once is usually adequate. But if it must be done again to insure a firm surface, wait until the entire width of the trail has been done once, then start again. Any snowmobile can be used for packing, the heavier machines setting a firmer base.

The machine must be kept flat at all times or the treads will angle into the snow and leave a ditch which must be filled in before it freezes into place. On traverses, pack flat by angling the machine into the hill: stand with both feet on the uphill side of the snowmobile and lean uphill. This creates a flat trail shelf. On extra steep hills, it's sometimes necessary to shovel snow to the low side of traverses to build the trail up and make it flat. This should be done before packing. If shelfing on traverses is done once early in the season, it should not have to be repeated, provided that the trail is kept packed.

Knowing when to pack is important. For instance, wet snow should not be packed if the temperature is expected to drop below freezing, because an unskiable frozen surface will result. When left alone, the wet snow will dry out with the drop to below freezing temperatures, resulting in loose granular, almost powder like snow, which is easily groomed after the freeze. Packing may be necessary several times during a heavy snow storm; otherwise so much snow will accumulate that you will not be able to keep the snowmobile flat. Keeping the machine flat while packing deep snow requires low speeds and a constant shifting of body weight. It is easier to begin packing after six inches of snow have fallen, and repeat each time that much snow accumulates.

Tracks may be set on packed trails when there is adequate cover to drag a track sled without having to worry about hitting stumps or rocks under the snow. Basically, all track sleds work in the same manner. There are two three-inch wide cutting blades set six inches apart which are mounted to a sled and pulled through the snow. The upper section of the blade is one inch wider than the lower section to allow for passage of the binding and ski boot. These blades carve two tracks through the snow about two to three inches deep. Track sleds must be heavy enough so that the cutting blades will dig into the packed snow surface. Areas that have hard snow conditions should check to be sure sleds they purchase or make will cut tracks in the prevailing conditions. Track sleds must also have lateral stability when pulled, to assure that they set straight tracks. This is especially important when going downhill.

Before setting tracks, choose a route that will prevent going over the same set of tracks twice. Parallel sets of tracks are useful wherever the trail is wide enough. On hills where skiers are likely to snowplow to maintain control, keep the track as far to the side as safely possible; otherwise, it will be eradicated after two or three skiers snowplow over it. Set two tracks on hills, one for going up and one for coming down.

Tracks should always be set with enough room on both sides for poling without hitting brush or trees, or interfering with other skiers. This is especially important for races. Setting speed should be low enough that the tracks are deep enough and do not fill in with snow thrown back by the sled. On downhill runs, speed should be low to prevent snow from coming off the sled and rolling into and filling the tracks. Do not set tracks on steep hills on touring trails if they will present control problems for skiers descending. Increased speed going uphill is usually necessary to keep the snowmobile from bogging down. If the machine does bog down, it will dig a hole which must be filled before the track can be reset from the bottom. If possible, set tracks going down the steeper hills and such problems will be avoided.

When tracks have been skied out or become iced, and when trails are packed hard or snow has melted and refrozen solid, control of skis is difficult and it's time to regroom. With proper grooming equipment, such trails can be good to excellent again without additional snow.

WINTER TRACK SETTING

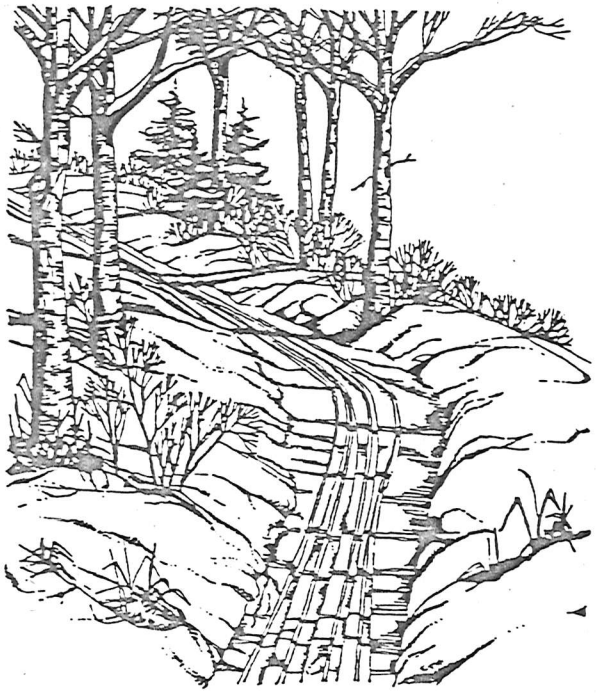
For good skiing, whether touring or racing, a set of ski tracks increase the pleasure to be had through this sport. The following points should be considered before setting a ski track:

1) At first snowfall begin by running over the trail route with a packing machine to pack down the snow. This may take 2 or 3 runs to pack the snow sufficiently for track-setting.

2) Once the snow is packed go over the route again using a track-setter. Depending on snow conditions this might also have to be repeated 2 or 3 times in order to get a firm track established.

3) Snow has the peculiarity of, when being disturbed, combining together and forming a more solid mass after a period of 24 hours. This fact is utilized by setting tracks at least a day ahead of when they are to be used so the skis can run in firm tracks and the poles do not sink into the snow. (Buss 1972).

4) Where possible on a trail, a pair of tracks should be set. This allows for the slower skier to step aside into the second set which gives him good directional skiing while the faster skier travels on without a break in stride. However, on hill corners skiers will invariably take the flattest turn. The tracks should be set so they come into the corner high on the outside and cut low to the inside. On slow, less tight turns parallel sets of tracks can still be used. On sharp steep corners no tracks should be set.



ALLOW TRACKS ON MODERATE SLOPES TO COME HIGH ON THE OUTSIDE AND CUT LOW TO THE INSIDE.

DO NOT SET TRACKS ON SHARP STEEP CORNERS.

e) Firnspeigel

Firnspeigel, depending on its thickness can be groomed in the same way crust is or may have to be groomed the way glare ice is.

f) Glare Ice

If tracks have to be set in glare ice then a great deal of grooming needs to be done in order to obtain enough material to work with.

Rotary Cultivators or Rotary Hoes can be used to groom ice. Several passes are needed to chip enough ice to form a soft medium. Increased efficiency from the rotary hoe or cultivator is obtained if weight is added.

Powered roto-tillers, like those used in the garden, have been used to break up ice but they are impractical on a long or wide trail. Wide, powered rotary cultivators have been custom-built to handle glare ice problems.

IV) What's Underneath or Snow History

What is underneath a thin layer of surface snow must be taken into account when making decisions on grooming.

If the underlying snow is dry, or wet, rotten or hard-crust with a one inch layer of new dry snow on top then the grooming decision has to be based on the conditions underneath the thin surface layer of new, fallen snow.

For example, if this inch of snow was packed it might yield one-half inch of compacted snow. A tracksetter normally needs two inches of material to work in. Supposing that underneath this half inch of packed snow is a hard crust. If one tried to set a track in this combination the track would not be satisfactory. More loose snow is needed. The hard snow needs to be groomed and churned up, mixing the new less dense snow with the older, denser snow to form a consistent medium of a suitable depth in which to set a track.

Different combinations of new snow in relationship to the underlying snow surface dictates different grooming decisions.

V) Short-Term Weather Forecast

The short-term weather forecast influences grooming decisions. For example, if the snow is very wet in the afternoon and you are thinking about grooming for tomorrow's skiers and the weather forecast is for a cold front coming in that evening, you may decide to wait till it is cooler before grooming. Grooming wet snow creates more moisture in the snow causing icing or glazing problems once the temperature drops.

Another example is, the snow is wet, but a strong wind is forecast for the evening and the temperature will remain warm. You could go ahead and groom and set track or you could churn up the snow, without setting track thereby exposing more snow to the drying effects of the wind. The track could be set in the morning with dryer snow.

There are many combinations of snow conditions and weather forecasts which influences the decision whether to groom or not and what type of grooming to do. The most obvious advantage of listening to the weather forecast is to save yourself work. It's no use grooming and tracksetting in the afternoon for tomorrow's skiers if two feet of new snow is forecast during the evening.

VI) Other Influencing Variables

There are many other variables which influence grooming decisions. Some of them include: the condition of the old tracks still remaining; the amount of time which is available in which to groom and track set; the equipment which is available to you; the condition of your trails; the amount of money you can afford to spend on a grooming program; who will be skiing on the trail. (recreational skiers versus racers.)

Extra Tips on Grooming

When grooming at night it is a good idea to have a light on the rear of your pulling machine to light up the area behind the grooming equipment.

Care should be exercised when pulling grooming equipment at night in a wooded area.

Normally you should groom the full width of your trail - in this way it is possible to mix the less dense unskied on outer edge snow with the denser track area snow.

4.2.4. TRACKSETTING

If there is a good snow surface to work with, sufficient conditioned snow to work in and a suitable tracksetter is available than it is not difficult to set good tracks.

The key to setting good tracks is to groom or condition the snow properly before attempting to set tracks.

I) When to Set Tracks

Tracks should normally be set as soon after the snow has been groomed as is feasible. The reason for this is that when the snow is groomed a certain amount of moisture is put into it by the pressure of the grooming equipment. If the track can be set before this moisture has had a chance to refreeze then when it does refreeze the track will become firm and hard or what is often referred to as a set-up track.

If possible, the grooming and tracksetting should be done in the late afternoon or early evening so that the tracks have a chance to set-up overnight.

Set-up tracks, being harder and firmer tend to stand up to more skier traffic before they start breaking up.

Tracks should not be set in wet snow in the afternoon if the night time temperature is to go below freezing. When the tracks are set in wet snow a layer of water collects in the bottom of them. When the temperature drops, this water freezes and forms an icy track.

II) How to Set Tracks

There are several differences in setting tracks for recreational skiers versus racers.

a) Recreational Tracksetting

Tracks set for the recreational skier are usually set parallel with the edge of the trail. If two tracks are set side by side, enough space must be left between them so that skiers skiing side by side do not snag poles or stab each other. An ideal distance between tracks is 1.2 metres (four feet).

On steep, uphill sections, tracks should not be set. The skier will wish to herringbone or sidestep up this section. If your tracksetter cannot be lifted, then set the track up the hill, and then rake the tracks out by hand.

On steep downhill sections, tracks also should not be set. The skier will want to snowplow down the hill. Tracks will cause the skier difficulty in getting into the snowplow and holding it down the hill.

When setting trails with cut-off loops in them, the short loop sections should be set first, before the outside perimeter trail is set.

When setting tracks the speed should not be so excessive that snow is thrown back into them.

If a heavy wind has been blowing recently and there is a great deal of debris on the trails (ie. sticks and branches) constant attention must be paid to the track. These sticks and branches can easily get caught in the mold blocks of the tracksetter causing snow to clog up, producing a poor quality track.

When setting tracks in a wooded area, do not set the tracks so close to the trees along the edge of the trail that skiers snag their poles in the bordering brush.

b) Tracksetting for Races

For races, the tracks do not always parallel the edge of the trail. The track on a corner is usually set to the inside coming into the turn and breaks to the outside coming out of the turn. This is the way the skier will want to ski a corner so he can carry maximum speed through it.

In sections of the trails that have S-bends in them, a straight line is usually set through the bends, cutting inside corner to inside corner.

Downhill sections are set. A racer seldom snow plows. Uphill sections are also set, except for extremely steep parts. Good racers can diagonal stride up hills.

On the downhill turns, the track is usually raked out, so that the racer can make a skate turn without the possibility of snagging a ski in the track.

The distance between double set tracks is 1.2 metres, measured from the middle to middle of the tracks, according to the FIS International Ski Competition Rules.

The distance between the two grooves in one track also varies. It can be 12 - 18 cm. on the flats and 8 - 12 cm. on the hills.

Tracksetter or Track Sleds

Tracksetters or Track Sleds can be made at home or can be be purchased commercially. The homemade tracksetter is usually a sled, a metal or wooden box, with two groove cutters or mould blocks on its underside. The commercially produced ones have been scientifically designed, experimented with and re-designed. As a result they usually set a better looking and longer lasting track.

Several of the commercially produced sleds have angled sidewalls. These have two advantages over vertical sidewalls.

1. Angled walls mean the mould blocks on the tracksetter can pack the sidewalls producing a longer lasting track. Vertical sided mould blocks exert very little pressure on the sides of the track.

2. With angled sidewalls there is less friction of the boot and binding with the sides of the track and hence faster glides.

Some commercially produced sleds have cutting blades attached which help to groom the snow before it reaches the mould blocks of the tracksetter.

Most homemade sleds have to have weights added, ie. concrete blocks or sand bags - in order to set a satisfactory track in harder snow conditions.

It is a good idea to tie these weights on to the tracksetter so they do not roll or fall off on hills.

Some commercial sleds have a device for lifting the mould blocks off the snow surface. This is advantageous when you do not wish to set tracks on a hill or where you are crossing or travelling down a roadway. This is really important if your trails have many steep hill sections. Sometimes the pulling equipment does not have enough power to pull a tracksetter, setting track, up a hill. As a result, the tracksetter must be disconnected from the pulling equipment, hauled manually to the top of the hill and refastened to the pulling machine. This is a very tiring job and also very time consuming.

Both commercial sleds and homemade sleds or tracksetters can set tracks satisfactory enough to be used by recreational skiers as long as there is well-conditioned snow to work in.

For national or international competition commercial sleds are normally used because of the higher quality of track produced by them.

4.2.5. TYPES OF COMMERCIAL TRACK SETTERS

1) Baechler "Loispenstar"

Baechler's "Loipenstar" system has two major components: the Tracksetter and the Renovator. The Tracksetter is designed to pack and cut a track in new, soft or untouched snow. For older snow, a Renovator is required to groom the snow before it is tracked by the Tracksetter. This makes it possible in certain conditions to groom and set in one operation.

The Baechler Tracksetter itself weighs only 95 lbs., making for easy pulling in soft snow. The Tracksetter's mould blocks can be adjusted to make the track width wider or narrower depending on whether you are setting on a hill or on the flats. It has side-guides which prevent the tracksetter from sideslipping on sloping terrain.

A snow rake can be attached to the rear of the Tracksetter and lowered to erase the track where desired. Wings can be attached to flatten out snow along fresh tracks for better pole plant areas.

There is a hydraulic system available to lift the track setter when you do not wish to set track or are travelling on roadways. Optional weights are available to add to the tracksetter.

The Baechler track has angled sidewalls that ensure that skis will be kept centered in the track without ski bindings touching the sides.

When the snow is old, the Baechler Renovator can be used to break-up the snow before tracking. The Renovator is attached in front of the tracksetter. Vertical cutting blades on the Renovator cut the snow in narrow vertical strips. Then, a second row of blades which may be adjusted for height and angle of cutting, cut through the snow horizontally below the already cut vertical tracks. The snow is chopped and mixed to be flattened and tracked by the trailing tracksetter. The Renovator weighs approximately 100 pounds and weights may be added to it.

An option available for use in low snow areas is the shovel attachment for the Renovator. Attached to each end of the horizontal cutting bar, the shovel will scoop snow to the centre for packing and tracking. The teeth of the Renovator can be lifted for transportation across roads.

The Tracksetter and Renovator are available as a tandem rig for double tracksetting. It is recommended by the manufacturer that a towing vehicle with twin tracks be used for pulling. In hard pack conditions, when the renovator is being used, a machine such as the Alpine does not have enough power to pull the working Renovator and Tracksetter. A larger pulling machine is needed.

The Baechler was used to set tracks for the 1976 Winter Olympics at Innsbruck. It also set some of the tracks at the 1979 Pre-Olympic Games in Lake Placid.

II) "Larven Track Setter"

The Larven system is built around a lightweight snow machine. Although it looks like a snowmobile the Larven snow machine is not. It is 178 cm (70") long with a two cycle engine and can only be operated if the driver is wearing a pair of skis to assist in steering.

Attached to the snow machine are the other components that make up the Larven system: the grader and tracksetter. The grader cuts, levels and packs a trail wide enough for a single track with outside poling areas.

After the groomer passes over the trail, the snow machine can be driven, pulling the track sled to form a single track. The track setter works on the cutting or shearing principle.

One of the attractive features of the Larven is its portability. The system can be packed up and carried to any location. The snow machine weighs 68 kilos (150 pounds), the track setter 28 kilos (60 pounds) and the grader 34 kilos (75 pounds). A car top carrier which holds the entire system is available.

III) Ski Trak II

Developed in 1978, Ski Track II is a unique Canadian designed and manufactured tracksetter.

This machine cuts a track into the snow, working on the shearing principle rather than the moulding or pressing of the Baechler.

The machine smooths and packs a poling area beside the tracks. The track has angled sidewalls making for less binding friction.

This machine is unique in that it is made of only two parts, making it easy to assemble and transport.

Weights may be added to make it cut better in hard pack conditions.

It has a shear pin equipped towing harness, saving the leading cutting edges from severe damage should an immovable obstacle be encountered.

The Ski Trak is advertised as being able to be pulled by any snowmobile. On steep uphills, smaller pulling machines may not have sufficient power, especially since the tracksetter cannot be raised.

Ski Trak is the official tracksetter for the Intercollegiate Canadian-American Ski Series in 1979 and 1980.

IV) Trak Pak - Trak Setter

The Trak Pak-Trak Setter is attached to the Track Pak Snow Grader. The tracksetter is easily removed by releasing two set screws.

Each tracksetting unit consists of a pair of track cleaners attached to a pair of weighted, grooved skis set with the proper clearance.

The tracks set by this machine have vertical sidewalls. A dual hitch is available to set a double track.

The track cleaners act as a cutting shear to dig up the snow before it reaches the mould skis.

This track-setter must be added to a trak-pak snow grader. It is not operable by itself.

A pulling machine with at least 20 hp. is recommended for pulling the grader and tracksetter.

4.2.6. PULLING EQUIPMENT

Throughout the study of grooming and tracksetting, the terms small pulling machines and large pulling machines have been used when referring to the type of equipment needed to pull grooming equipment or tracksetters. What type of machines or vehicles are included in these two classifications?

I) Small Pulling Machines

Machines in this classification include any snowmachines from the size of the Ski-Doo Alpine and smaller. In reality, any snow machine that uses front mounted skis for turning. Manufacturers of these machines include Ski-Doo, Moto Ski, John Deere, Yamaha, Kawasaki, Polaris, Arctic Cat.

The Alpine is the ideal small machine for pulling grooming and tracksetting equipment. It has good low speed power, a reverse gear and twin tracks. The Alpine is designed for use as a work machine rather than a recreational vehicle.

Other smaller machines, with less power can also be used, but because of their lack of low speed power they are very limited as to what type of grooming and tracksetting equipment they can pull and under what conditions.

CROSS-COUNTRY TRACKSETTING EQUIPMENT

BAECHLER *LOIPENSTAR* (SWISS PATENT) MANUFACTURED IN CANADA

P R I C E L I S T — SEPTEMBER, 1979

Model Number	Description	Price
LSTS	Picture A. Single Tracksetter with one single bar	$ 725.00
LSRV	Picture B. Renovator complete with one single bar	1,273.00
LSCO	Picture C. Single Tracksetter and Renovator with two single bars	1,998.00
LSTSD	Picture D. Double Tracksetter (two single tracksetters LSTS connected) with one double bar, no single bars	1,617.00
LSRVD	Double Renovators (two single renovators PL connected) with one double bar, no single bars	2,675.00
LSCOD	Double Tracksetter and Renovator (two combis connected) with two double bars, no single bars	4,292.00

All prices are quoted in Canadian currency.

All prices are F.O.B. Vancouver, B.C.

One Year Guarantee against manufacturing defects.

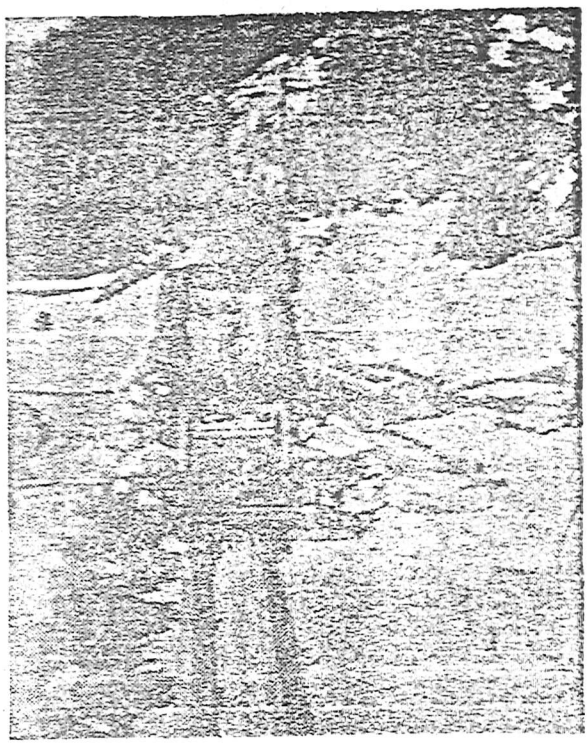
Payments - 50% on order - balance prior to delivery or C.O.D.

Delivery date - quoted with order - approx. 4 to 6 weeks.

Prices subject to change without notice.

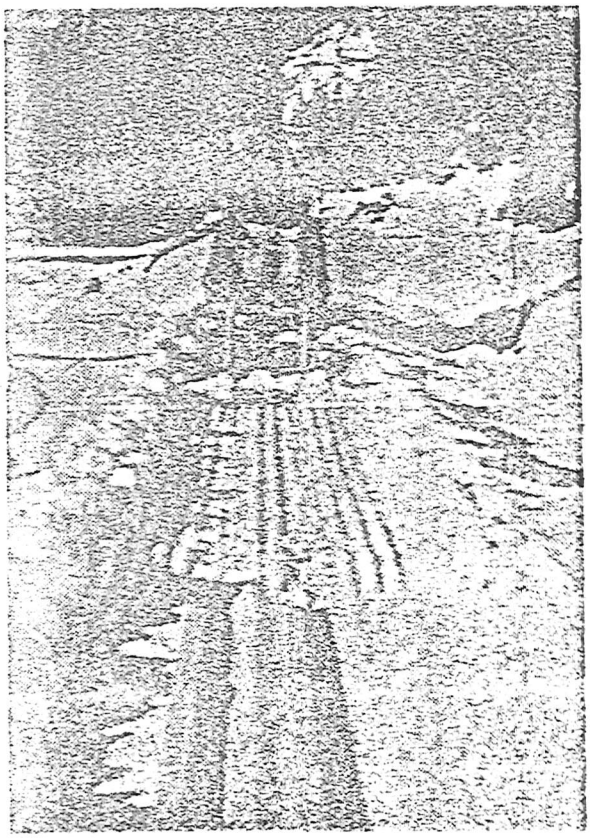
Orders with full payment - discount 2%.

BAECHLER SUPERIOR TRACKSETTING EQUIPMENT



The world's most advanced ski track equipment engineered by Baechler, masters all snow conditions setting a technological breakthrough in ski track forming. It can be pulled easily by a single or double track skidoo.

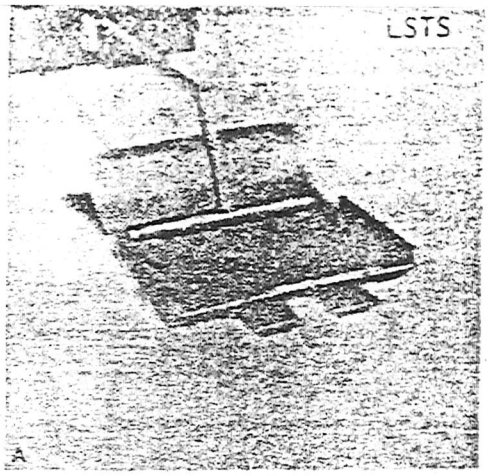
All types of skis (racing or touring) will be kept firmly centered in this type of track without the ski bindings touching the sides. This method produces a highly efficient track which requires minimum maintenance and is long lasting. It also has the advantage (while the new profile pushes the snow down) that even with a minimum of snow a satisfactory track can be achieved.



The attachable rake can be assembled simply with a screw on either end at the rear of the tracksetter.

This attachment removes the ski tracks in downhill areas and narrow or dangerous passages where skiiers should be able to ski freely without tracks.

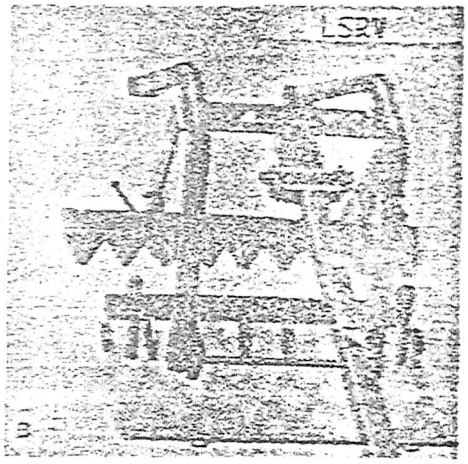
This simple but ingenious mechanism eliminates loading and unloading the tracksetter in these areas.



A. Single Tracksetter LSTS

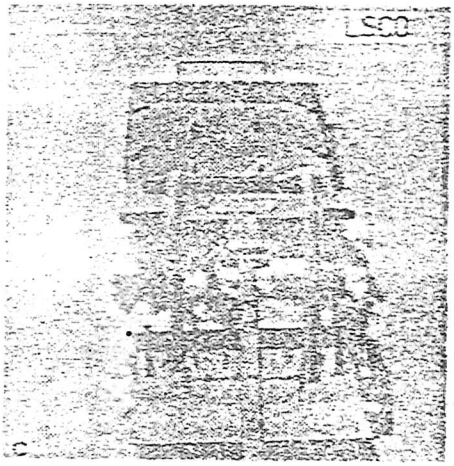
The width of the track can easily be changed by adjusting the eye bolts on the equipment. Adjustable side guides will insure a stable direction in any kind of terrain at high speed. It can also be attached to the renovator.

For the limited budget - a high return.
Weight approx. 43kg (95lb)



B. With the Renovator PL (picture B) we have a totally new device on the world market. It serves to renew uneven and icy tracks with remarkable efficiency. With the diagonal knives in conjunction with the forward knives, snow and ice are cut into small parts. By specially fitted horizontal knives, the particles are intermixed with soft snow and flattened to the width of the track. Each knife is independently mounted and easy to replace. Both machines work effortlessly in unison. Old tracks can be quickly renewed in this manner. It is only used in front of the LSTS. and can be connected to the tracksetter with a bar and very little effort.

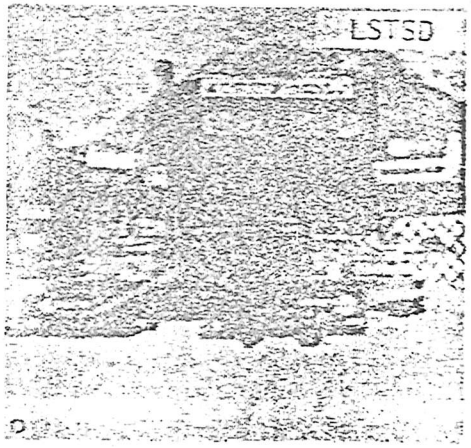
Weight approx. 43kg (95lb)



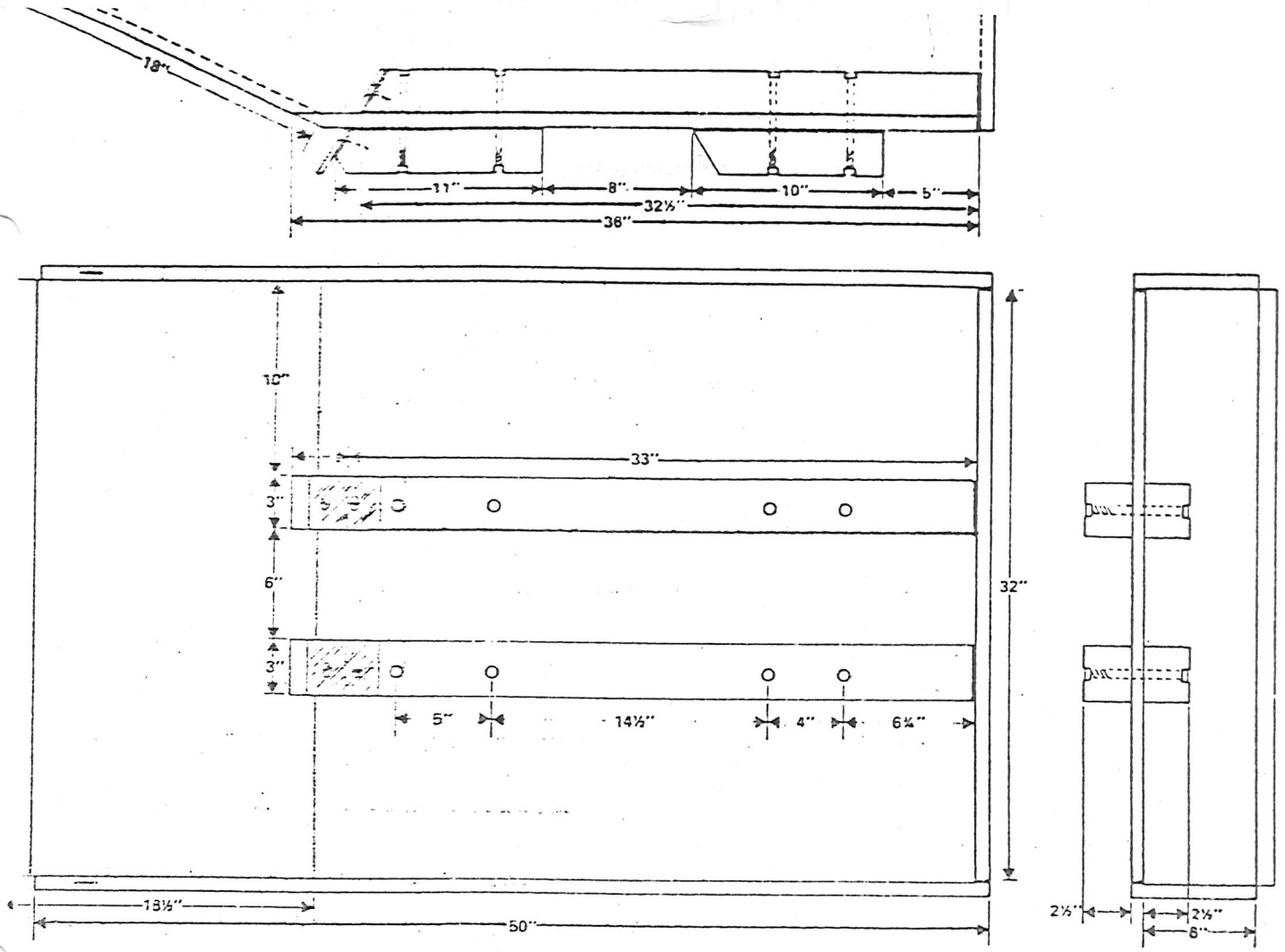
C. Single Tracksetter with Renovator Combined LSCO

This equipment is used in combination with the single tracksetter (picture A) and the Renovator (picture B).

Weight approx. 86kg (190lb)



D. Two single tracksetters LSTS or two tracksetters with renovators (LSCO) can be connected by a double bar to form two pairs of parallel tracks equally spaced one metre apart.



The advantages of such a manicured track are also a big help to beginners. The even contour of the trail layout aids the learning process. Just as rough, gutted ice is a difficult surface on which to learn skating, an ungrooved trail is a less-than-ideal place for the beginning nordic skier. Track-setters produce a pair of grooves that give stability to the skiing motion for novices and racers alike. The racer can concentrate on speed via a hard, efficient kick, knowing that his skis won't slide to the side. The beginner, safe in the security of a grooved-trail network, can practice the fundamental motion of walking and sliding on skis without the worry of having his skis vanish from underneath him.

Track-sled assembly diagram (in inches)

Light, new snow or soft cover snow in the backcountry — far from machine-groomed trails — is a delight to ski. In the right conditions, even the beginner can carve wide snowplow turns downhill. No one will contest that those moments are some of the finest in the cross-country experience — an experience when such conditions give an unlimited range of travel.

Unfortunately, these soft snow conditions are rare, and have been especially so with the fluctuating weather moods of the past few seasons. When snow hardens, it's difficult — and often impossible — to set out for a tour in your local woods. The snow may be crusty or icy, and it will be slow, unenjoyable going — a far cry from touring in optimal conditions.

That's where track-setting comes in. Machine-groomed trails allow for skiing in conditions that would otherwise be unenjoyable. On a cold morning after the previous day's mushy snow has refrozen hard, a track sled and snowmobile combination will pack out a trail and then cut a double groove. A track sled also will "farm up" unmetamorphised snow just underneath the surface and recycle it to the top layer, much like the action of a roto-tiller in a garden. Result: Even on an icy, miserable day, a machine-grooming setup can provide skiable trails.

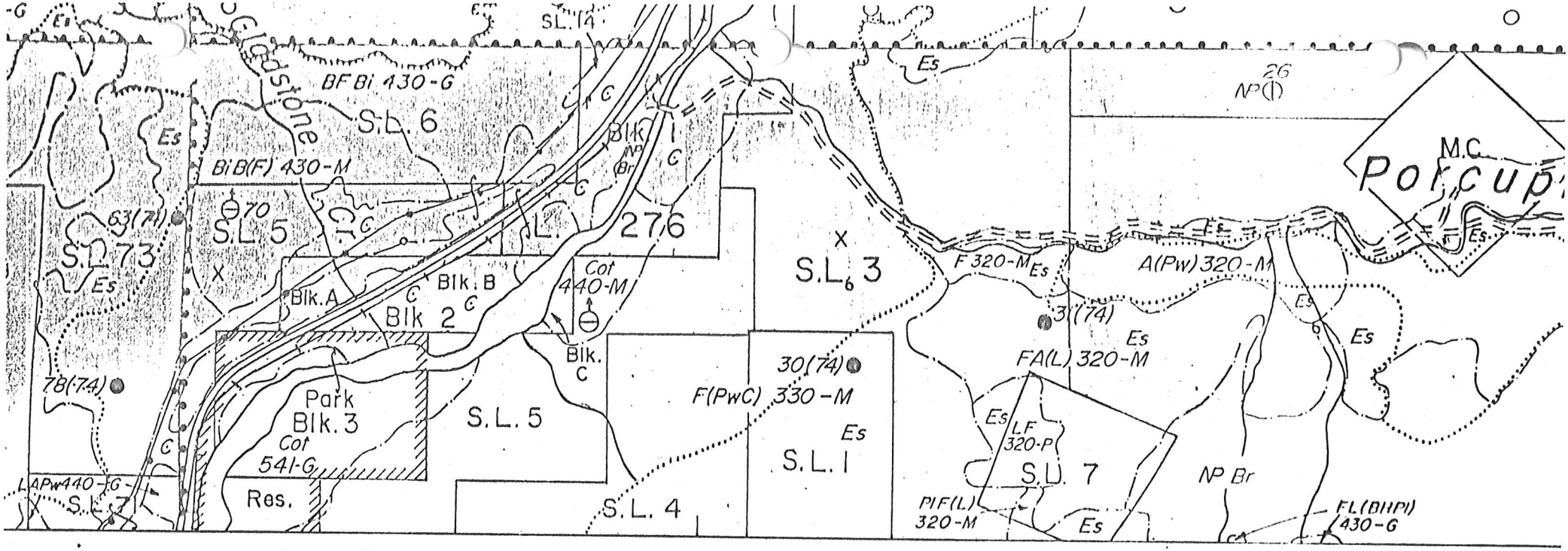
That brings us to the subject of touring centers and the possibility of making your own tracks. On one of those miserable days you either don't ski, or you head to a touring center where, for a modest trail fee (usually $1-$4), you can ski all day on carefully prepared tracks. There are a multitude of cross-country centers in northern states, and many — besides offering instruction, rentals and in some cases meals and lodging — are worth the trip just to experience the Scandinavian-style atmosphere and ambience.

At the same time, many touring centers offer little more than a bare-bones ski shop and a hastily-prepared trail system. That's where the idea of owning your own track-setting equipment comes in. You can build a sturdy wooden track-sled to pull behind a snowmobile for as little as $30 in materials. Or for as much as $900 (for a track sled and a gyro groomer from Woodcrest, Inc., Bradford, N.H.), you can buy the same type of trail-grooming equipment that will be setting tracks for the next Olympics at Lake Placid.

At either end of the spectrum, making your own trails for all-condition skiing is a real possibility, - if you're willing to invest the time. If you are, and know another enthusiastic skier or two, you easily can convert a large backyard or

APPENDIX C

FOREST TYPES



TO SOUTH SEE MAP 82-F-3-g

TYPE DESCRIPTIONS

Each mature or immature forest type contains a descriptive label which indicates species composition, age class, height class, stocking class, and site class. If applicable, scattered veterans, secondary volume or secondary immature will appear.

SPECIES – Major species over 20 % of gross volume stated in order of predominance. Minor species comprising 10 - 19 % of gross volume are bracketed. Species composition of younger immature stands are based on number of stems.

AGE

Age Class	Limits Yrs.
1	1 – 20
2	21 – 40
3	41 – 60
4	61 – 80
5	81 – 100
6	101 – 120
7	121 – 140
8	141 – 250
9	251+

HEIGHT

Height Class	Limits Ft.
1	1 – 35
2	36 – 65
3	66 – 95
4	96 – 125
5	126 – 155
6	156 – 185
7	186 – 215
8	216+

SITE

G – Good M – Medium
P – Poor L – Low

STOCKING

Stocking Class	Apply to	Limits – No. of trees/acre by d.b.h. class
0	all immature	N.A.
1	all mature	31+/acre, 11.1"+ d.b.h.
2	all mature	0–30/acre, 11.1"+ d.b.h.
3 Sub-division of 2	mature, Pl leading species	126+/acre, 7.1"+d.b.h. and 50 %+ of stems are 5.1"+d.b.h.
4 Sub-division of 2	mature, Pl leading species	0–125/acre, 7.1"+d.b.h. or 126+/acre, 7.1"+ d.b.h. and <50% of stems are 5.1"+ d.b.h.

Scattered veterans e.g.+ F Vets.
Secondary volume e.g.+ F Vol.
Secondary immature e.g.+ F Imm.

EXAMPLES OF FOREST AND NON-FOREST MAP LABELS

(a). FC(H)741-P – a mature FC type with H comprising 10–19 % of gross volume. Age 121–140 years; height 96–125 feet; stocking of over 31 trees/ac. 11.1"+ d.b.h. Poor site.

(b). BSPI 320-M – an immature BSPl type. Age 41–60 years; height 36–65 feet. Stocking zero means type is immature. Medium site.

(c). FCH220-G +F Vol. – an immature FCH type. Age 21–40 years; height 36–65 feet. Secondary fir volume present in loggable quantity. Good site.

(d). NSR-M ⊖60 +FC Vets – an NSR type. Medium site. Original stand logged in 1960. Scattered FC Veterans occur.

(e). NP HCPI 811 – an extensive scrubby non-productive lowland type of HCPI. Age 141–250 years; height 1-35 feet; stocking of over 31 trees/ac. 11.1"+d.b.h.

(f). NC Br – M – a minor area of non – commercial brush growing on a medium forest site.

(g). Es, Er, Ew, Ec (+Bdy.) – sensitive areas due to soil (s), recreation (r), fish or wildlife (w), or critical management problems (c).

BRITISH COLUMBIA FOREST SERVICE
FOREST INVENTORY DIVISION

FOREST COVER SERIES

Scale 1:15,840

0 1/4 1/2 3/4 1 Mi.
0 20 40 60 80 Ch
0 500 1000 1500 Metres

HISTORY SYMBOLS

Disturbance	Percent volume removed or destroyed 1-25 %	26-75 %	76-100 %
Logged	⊖60	BS84 Resid-M ⊖60	NSR-M +FC Vets ⊖60
Burned	60(G) ⓘ	BS84 Resid-M 60 ⓘ	NSR-M 60 ⓘ
Windfall	⅄	BS84 Resid-M ⅄	NSR-M ⅄
Insects or Disease	Looper kill	BS84 Resid-M Looper kill	NSR-M Looper kill

e.g. – ⊖60 – logged in 1960.
– NSR-M – not satisfactorily restocked.
– BS84 Resid-M ⊖60 – residual stand of balsam after 1960 logging; that is, remnants of a stand result selective cutting. May also stands affected by fire, insects or disease.
– DSD-M ⓘ – disturbed stocking doubtful
– F ⓟ 72 – reforested (Fir) plantation 1972

117°07'30"

REFERENCE

Region ..... R 47

Compartment ..... (19)

Managed Crown land boundary ..... Name

Park, water area, ecological res. tree farm licence, boundaries ..... Name

Major type lines .....

Ground sample, number (year) ..... 5(61)

Photo sample, number (year) ..... 6(61)P

Permanent growth sample, number (year). P 7(63)G

Experimental plot, number (year) . E.P 302(67)

Air calls X

Ground calls with measurements ..... XG

Low level photo XL

Flight line, photo centres .....

Main road .....

Secondary road .....

Other: e.g. logging, forest road .....

Trail definite ——— Indefinite – – –

Railroad .....

Railroad abandoned .....

Flume, ditch .....

Pipe line .....

Dam ..... Sawmill: Stationary

Power-line ..... Mine .....

Wharf ..... Lookout .....

Post office ..... PO Triangulation station

Forest Service Ranger Station .....

SPECIES ABBREVIATIONS

F—Douglas fir.
C—Western red cedar.
H—Hemlock.
B—True fir (balsam).
S—Spruce.
Sb—Black spruce
Cy—Yellow cedar.
Pw—White pine.
Pl—Lodgepole pine.
Py—Yellow pine.
L—Larch.
Cot—Cottonwood.
D—Alder.
Mb—Broadleaf maple.
Bi—Birch.
A—Aspen.
Pa—Whitebark pine.

SYMBOLS FOR NON-FOREST LAND

A For - Alpine forest
A — Alpine.
R — Rock.
R — Rock slide.
— Sand or gravel.
NP (1) - Non-productive, burned.
NP Br - Non-productive brush.
— Swamp or Muskeg.
C — Cultivated, cleared or urban.
M — Wild hay meadow
OR - Open range.

Other classes are written out.

When ordering maps, show

Index No. 82
Alphabet letter ..... K
Sheet number 7
e.g. 82 K/7 c

e	f	g	h
	7		
d	c	b	a

Note - Copies of maps obtainable at cost on application to the Chief Forester, Victoria B.C.

82-F

APPENDIX D

SOIL TYPES

Locality	Unit	Carbonated Rego Gleysol / Rego Gleysol	p,v	Carbonated Rego Gleysol	p,v	Parent Material	Elevation (m)	Biogeoclimatic Subzone
	LE1	Carbonated Rego Gleysol	p,v			medium and moderately fine textured alluvial deposits	530 - 535	interior western hemlock - western red cedar complex *
	LE2	Rego Gleysol	p,v	Carbonated Rego Gleysol	p,v			
Lister	LR1	Orthic Gray Luvisol	w			fine and very fine textured glacio lacustrine deposits	580 - 700	interior western hemlock - western red cedar complex **
	LR2	Orthic Gray Luvisol	w	Gleyed Gray Luvisol	i			
Lumley	LY1	Brunisolic Gray Luvisol	w	Orthic Dystric Brunisol	w	moderately fine textured glacio lacustrine deposits	460 - 1070	interior western hemlock - western red red cedar complex **
	LY2	Brunisolic Gray Luvisol	w	Orthic Gray Luvisol	w			
	LY3	Brunisolic Gray Luvisol	w					
	LY4	Brunisolic Gray Luvisol	w	Bisequa Humo-Ferric Podzol	w			
				seepage phases	i			
Rosaland	RL1	Sombric Humo-Ferric Podzol	w	Sombric Ferro-Humic Podzol	w	shallow, medium to very coarse textured colluvium over bedrock	2100 - 2700	subalpine Engelmann spruce - alpine fir ***
				lithic subgroupe	r			
		alpine phase		alpine phase	w			
	RL2	Sombric Humo-Ferric Podzol	w	Sombric Ferro-Humic Podzol	w			
				Orthic Humo-Ferric Podzol	w			
		alpine phase		lithic subgroups	r			
				seepage phases	i			
				alpine phase	w			
	RL3	Lithic Sombric Humo-Ferric Podzol	r	Sombric Humo-Ferric Podzol	w			
		alpine phase		Sombric Ferro-Humic Podzol	w			
				alpine phase				
Sandon	SA1	Orthic Humo-Ferric Podzol	m,w	seepage phase	i	medium and moderately coarse textured basal till	1770 - 1220	subalpine Engelmann spruce - alpine fir
	SA2	Orthic Humo-Ferric Podzol	m,w	Orthic Ferro-Humic Podzol	m			
				Sombric Humo-Ferric Podzol	m,i			
				seepage phases	i			
Syringa	SG1	Orthic Dystric Brunisol	w			moderately coarse to moderately fine textured basal till	420 - 1270	interior western hemlock - western red cedar complex **
	SG3	Orthic Dystric Brunisol	w	Orthic Humo-Ferric Podzol	w			
	SG4	Orthic Dystric Brunisol	w	Orthic Humo-Ferric Podzol	w			
				seepage phases	i			
	SG5	Orthic Dystric Brunisol	w	Brunisolic Gray Luvisol	w			
				Orthic Eutric Brunisol	w			
Swanee	SH1	Orthic Humo-Ferric Podzol	m,w	seepage phase	i	moderately coarse and very coarse textured basal till	1770 - 2200	subalpine Engelmann spruce-alpine fir
	SH2	Orthic Humo-Ferric Podzol	m,w	Orthic Ferro-Humic Podzol	m			
				Sombric Humo-Ferric Podzol	m,i			
				seepage phases	i			
Sentinel	SL1	Orthic Humo-Ferric Podzol	w			medium and moderately coarse textured basal till	910 - 1770	interior western hemlock - western and lower part of subalpine Engelmann spruce-alpine fir
	SL2	Orthic Humo-Ferric Podzol	w	seepage phase	i			
	SL3	Orthic Humo-Ferric Podzol	w	Orthic Ferro-Humic Podzol	m			
				Sombric Humo-Ferric Podzol	m,i			
				seepage phases	i			
	SL5	Orthic Humo-Ferric Podzol	w	Orthic Dystric Brunisol	w			
	SL6	Orthic Humo-Ferric Podzol	w	Bisequa Humo-Ferric Podzol	w			
				seepage phases	i			
Slocan	SN1	Orthic Humo-Ferric Podzol	w			very coarse and moderately coarse textured basal till	910 - 1770	interior western hemlock - western red cedar complex and lower part of subalpine Engelmann spruce-alpine fir
	SN2	Orthic Humo-Ferric Podzol	w	seepage phase	i			
	SN3	Orthic Humo-Ferric Podzol	w	Orthic Ferro-Humic Podzol	m			
				Sombric Humo-Ferric Podzol	m,i			
				seepage phases	i			
	SN5	Orthic Humo-Ferric Podzol	w	Orthic Dystric Brunisol	w			
	SN6	Orthic Humo-Ferric Podzol	w	Bisequa Humo-Ferric Podzol	w			
				seepage phases	i			
Salmo	SO1	Orthic Dystric Brunisol	w,r			moderately coarse and very coarse textural basal till	420 - 1220	interior western hemlock - western red cedar complex **
	SO2	Orthic Dystric Brunisol	w,r	seepage phase	i			
	SO3	Orthic Dystric Brunisol	w,r	Orthic Humo-Ferric Podzol	w,r			
	SO5	Orthic Dystric Brunisol	w,r	Brunisolic Gray Luvisol	w			
				Orthic Eutric Brunisol	w			
Shields	SS1	Bisequa Humo-Ferric Podzol	w	seepage phase	i	moderately fine and medium textured basal till	910 - 1770	interior western hemlock - western red cedar complex and subalpine Engelmann spruce- alpine fir
	SS2	Bisequa Humo-Ferric Podzol	w	Orthic Humo-Ferric Podzol	w			
				seepage phases	i			
	SS3	Bisequa Humo-Ferric Podzol	w	Orthic Ferro-Humic Podzol	m			
				Sombric Humo-Ferric Podzol	m,i			
				seepage phases	i			
	SS4	Bisequa Humo-Ferric Podzol	w	Brunisolic Gray Luvisol	w			
Skelly	SY1	Brunisolic Gray Luvisol	w	Orthic Dystric Brunisol	w	moderately fine and medium textured basal till	420 - 1220	interior western hemlock - western red cedar complex **
	SY2	Brunisolic Gray Luvisol	w	Orthic Eutric Brunisol	w			
	SY3	Brunisolic Gray Luvisol	w	Orthic Gray Luvisol	w			
	SY4	Brunisolic Gray Luvisol	w	Orthic Humo-Ferric Podzol	w			
				seepage phases	i			
	SY5	Brunisolic Gray Luvisol	w	Bisequa Humo-Ferric Podzol	w			
				seepage phases	i			
Trail	TL1	Orthic Humo-Ferric Podzol	r			moderately coarse and very coarse textured ablation till	1220 - 1520	subalpine Engelmann spruce-alpine fir
Tye	TY1	Orthic Gray Luvisol	w			medium and moderately fine textured basal till	540 - 730	interior western hemlock - western red cedar complex **
	TY2	Orthic Gray Luvisol	w	Brunisolic Gray Luvisol	w			
Ymir	YR1	Orthic Regosol	r			loose, stony and bouldery talus deposits	460 - 2740	interior western hemlock and subalpine Engelmann spruce-alpine fir
	YR2	Orthic Regosol	r	Orthic Humo-Ferric Podzol	r			

* edaphic conditions generally favor black cottonwood climax forests.

** edaphic conditions generally favour Douglas-fir climax forests.

*** generally consists of the krummholz subzone with inclusions of alpine areas.

	SY3	Brunisolic Gray Luvisol	w	Eluviated Humo-Ferric Podzol seepage phases	w i			
Trail	TL1	Orthic Humo-Ferric Podzol	r			moderately coarse and very coarse textured ablation till	1220 - 1520	subalpine Engelmann spruce-alpine fir
Tye	TY1	Orthic Gray Luvisol	w			medium and moderately fine textured basal till	540 - 730	interior western hemlock - western red cedar complex *
	TY2	Orthic Gray Luvisol	w	Brunisolic Gray Luvisol	w			
Ymir	YR1	Orthic Regosol	r			loose, stony and bouldery talus deposits	660 - 2740	interior western hemlock and subalpine Engelmann spruce-alpine fir
	YR2	Orthic Regosol	r	Orthic Humo-Ferric Podzol	r			

* edaphic conditions generally favor black cottonwood climax forests.

** edaphic conditions generally favour Douglas-fir climax forests.

*** generally consists of the krummholz subzone with inclusions of alpine areas.

MISCELLANEOUS LAND TYPES

Glacier I	Permanent ice and snow
Organic deposits O	Deposits of undecomposed to decomposed organic material
Bedrock RO	Bedrock exposed at the land surface

DRAINAGE CLASSIFICATION

r	rapidly drained	i	imperfectly drained
w	well drained	p	poorly drained
m	moderately well drained	v	very poorly drained

LANDFORMS

A. General origin of landforms	Symbol	B. Surface form or pattern of landforms	Symbol
Aeolian	E	Beach	b
Colluvium	C	Channelled (ridge and swale)	c
Fluvial (alluvial)	F	Delta	e
Glacial fluvial	G	Drumlin(ized)	d
Lacustrine (glacial)	L	Dune(d)	n
Glacial Till - basal	T	Eroded (active) or dissected (non-active)	v
Glacial Till - ablation	A	Esker(s), crevasse filling	e
Bedrock	R	Fan	f
Organic	O	Fluted	u
		Hummocky	h
		Kame	m
		Kettle(d)	k
		Plain	p
		Talus Cone	r
		Terrace	t
		Steepland	s
		Meltwater channel	w

Overlays are indicated by a slash (/)

TOPOGRAPHIC CLASSES

Single slopes (regular suface)	Multiple slopes (irregular surface)	%
A depressional to level	a nearly level	0 to 0.5
B very gently sloping	b gently undulating	0.5+ to 2
C gently sloping	c undulating	2+ to 5
D moderately sloping	d gently rolling	5+ to 9
E strongly sloping	e moderately rolling	9+ to 15
F steeply sloping	f strongly rolling	15+ to 30
G very steeply sloping	g hilly	30+ to 60
H extremely sloping	h very hilly	over 60

MAP SYMBOL

Example: